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THE

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AND OF THE

INSTITUTIONS IN UNION.

VOLUME XII.

FROM NOVEMBER 20, 1863, TO NOVEMBER 11, 1864.

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THE

Journal of the Society of Arts,

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THE INSTITUTIONS IN UNION.

No. 574.] FRIDAY, NOVEMBER 20, 1863. [Vol. XII.

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NOTICE TO MEMBERS.

One Hundred and Tenth Session, 1863-4.

The following are the dates of the meetings for the present Session. The chair is taken at Eight o'clock:—

1863. November	—	—	18	25	
„ December	2	9	16	—	—
1864. January	—	—	20	27	
„ February....	3	10	17	24	
„ March....	2	9	16	—	30
„ April	6	13	20	27	
„ May....	4	11	18	25	
„ June	—	—	—	29*	

For the Meetings previous to Christmas the following arrangements have been made:—

November 25.—"The Australian Colonies, their Condition, Resources, and Prospects." By Sir Charles Nicholson, Bart. On this evening Samuel Gregson, Esq., M.P., will preside.

December 2.—"On Magneto-Electricity, and its Application to Lighthouse Purposes." By F. H. Holmes, Esq.

December 9.—"Agricultural Progress: its Helps and its Hindrances." By J. Chalmers Morton, Esq. On this evening John Grey, Esq., of Dilston, will preside.

December 16.—"On the Economic Value of Foods, having special reference to the Dietary of the Labouring Classes." By Dr. Edward Smith, F.R.S.

The Council have made arrangements for the delivery of Courses of Lectures (under the title of "the Cantor Lectures") on the following subjects during the ensuing Session:—

Fine Arts Applied to Industry. By W. Burges, Esq.
Chemistry Applied to the Arts. By Dr. F. Crace Calvert, F.R.S.
International Commerce. By G. W. Hastings, Esq., Barrister-at-Law.

These Lectures will be open to Members and their Friends on the same conditions as the Ordinary Meetings. The course by Mr. G. W. Hastings will be "On the Operations of International Commerce on the Existing Laws of Maritime Warfare," and will consist of four lectures, two of which, "On the Law of Blockade," will be delivered on Monday evenings, the 7th and 14th December, at 8 o'clock. The other two lectures will be delivered after Christmas; the dates will be duly announced.

The Michaelmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

* The Annual General Meeting: the Chair will be taken at Four o'clock. No Visitors are admitted to this Meeting.

COUNCIL.

The following Institution has been received into Union since the last announcement:—

Stepney Deanery Board of Education.

FIRST ORDINARY MEETING.

Wednesday, November 18, 1863.

The First Ordinary Meeting of the One-Hundred-and-Tenth Session was held on Wednesday, the 18th inst. William Hawes, Esq., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Adams, Benjamin	Bank of England, E.C.
Aitchison, David	180, Piccadilly, W.
Bachhoffner, Dr. George Henry, F.C.S.	204, Marylebone-road, N.W.
Bagshaw, William E. ...	3, Compton-ter., Islington, N
Baker, George	8a, Lucknow-terrace, Bayswater, W.
Ball, Walter F.	3, St. John's-pk-villas, N.W.
Bankart, James	10, Trinity-square, S.E.
Bass, Michael Thos., M.P.	19, Lower Belgrave-st., S.W.; and Rangemore, Burton-on-Trent.
Berrall, William	39, Bedford-square, W.C.

Bewick, Thomas John ...	Allenheads, Northumberland.
Blackbourn, John	6, Trinity-terrace, Trinity-square, Brixton, S.
Blockley, John	2, Park-road, Haverstock-hill, N.W.
Blyth, Alfred	38, Westbourne-terrace, W.
Boehm, J. Erasmus	28, Brompton-crescent, S.W.
Bond, Francis T., M.D....	Hartley Institution, Southampton.
Bowkett, Thomas E.......	2, Folkestone-terrace, Poplar, E.
Bowman, Robert	10, Church road West, Islington, N.
Boyd, Dr.	10, Norfolk-terrace, W.
Bryson, John Miller	57, Roupell-street, Lambeth, S.
Buckland, Francis T., M.D.	156, Albany street, N.W.
Burgh, Nicholas............	78, Waterloo-road, S.
Burnell, Edward H.	32, Bedford-row, W.C.
Burt, Major Thomas Seymour, F.R.S.	18, Wilton-place, Regent's-park, N.W.
Busher, Edward D.	11, St. Leonard's-terrace, Chelsea College, S.W.
Bussey, George G.	14, Eton-villas, Haverstock-hill, N.W.
Butler, Charles, F.R.G.S.	13, Sussex-square, Hyde-park, W.
Butt, Isaac, Q.C., M.P....	8, Broad Sanctuary, Westminster, S.W.
Buttery, Charles	173, Piccadilly, W.
Cardwell, Reginald	11, Cromwell-place, South Kensington, W.
Chorley, Thomas Fearncombe	48A, Moorgate-street, E.C.
Clark, Edward Rawson ...	Drayton-villa, West Brompton, S.W.
Cleland, W.	24, Circus-road, St. John's-wood, N.W.
Coe, Ernest Oswald	7A, Brook-street, Grosvenor-square, W.
Cole, Edward S.	6, Thurloe-place, Brompton, S.W.
Collinge, Arthur, C.E. ...	10, Marlborough-place, Kennington, S.
Cooke, Christopher	13, Chatham-place, E.C.
Cooke, Major Anthony, R.E.	95, Mount-street, Grosvenor-square, W.
Cope, William	26, Gloucester-crescent, Regent's-park, N.W.
Corderoy, George	17, King William street, Strand, W.C.
Corderoy, John	3, Kennington-green, S.
Cronmire, John Martin...	10, Bromehead street, Commercial-road-east, E.
Currie, Edmund Hay ...	Bromley, Middlesex, E.
Davis, Matthew Boulton .	22, Buckingham-st., Strand, W.C.
Dunn, Spencer	10, King-st., Finsbury, E.C.
Emly, Samuel Frederick	12, Norfolk-st., Strand, W.C.
Evans, John E.	6, Albion-road, Hampstead, N.W.
Evans, John Hilditch ...	60, Bartholomew Close, E.C.
Faulkner, John	2, Mornington-crescent, N.W.
Field, Sidney	Northcote, Reigate.
Fisher, Joseph	Great Western Railway Station, Paddington, W.
Fletcher, Isaac	Tarnbank, Workington.
Greig, Alexander M.......	Ranelagh-road, Pimlico, S.W.
Guye, Auguste	8, Guildford street, Russell-square, W.C.
Hammond, Edwin.........	23, Hamilton-street, Camden-ton, N.W.
Harris, Wm. H., F.C.S.	33, Gold-st., Northampton.
Hewitt, Jonas B.	5, Angel-court, E.C.
Highton, T. Charles......	32, Norfolk-st., Strand, W.C.
Hill, Nicholas Stanton ...	Liverpool.
Hunter, Christopher	34, Penton-st., Pentonville, N.
Kayess, William Henry Tucker	23, Milk-street, E.C.; and Forest-hill, S.E.
Kindersley, Septimus Wigram	38, Chapel-street, Belgrave-square, S.W.
Lorberg, William, Ph. D.	4, Wyld's-rents, Bermondsey, S.E.
Maclean, William	Grove-hill, Camberwell, S.
Marsden, Joseph Daniel .	Edmonton, N.
Martin, Charles	11, Langham place, W.
Michael, Jacob	Southfield-lodge, Southfields, Wandsworth, S.W.
Middleton, James	2, Brook-street, Gloucester-place, W.
Oakley, William	High street, Bromley, E.
Potter, William............	10, St. John's-wood-park, N.W.
Punshon, Rev. Wm. Morley, M.A.	8, Arundel square, Islington, N.
Purdue, Thomas	Witney, Oxfordshire
Randell, Charles	51, Rutland-gate, S.W.
Rucker, Martin Diederich	115, Leadenhall-street, E.C.
Sabine, Robert	39, Bessborough-gardens, Belgrave-road, S.W.
Shaw, James Veitch	The Elms, Twickenham, S.W., and Knight Rider-street, Doctors' Commons, E.C.
Stubbs, John Heath	Bennett's-hill, Birmingham.
Smith, Edward, M.D., F.R.S.....................	16, Queen Anne-street, Cavendish-square, W.
Tatam, William	Langriville, Boston, Lincolnshire
Taylor, Walter	Ranelagh-rd., Pimlico, S.W.
Tupp, John..................	27, Oxford-street, W.
Tylee, John	Bridge-street, Bath.
Watt, James	Caithness, Pavement Quarries, and Mount Pleasant, Thurso, N.B.
Weir, Edward	142, High Holborn, W.C.
White, George	70, Russell-square, W.C.
Winter, James	100, Wardour-street, W.
Wolff, Sir Henry Drummond, K.C.M.G.	The Albany, W.

The Chairman delivered the following

ADDRESS.

Having been elected, through the kindness of my colleagues on the Council, to be their Chairman this year, it becomes my duty to deliver the Opening Address of the session. It is unfortunate for me that I should follow so able a Chairman as my friend Sir Thomas Phillips, who conferred such marked benefits on the Society during the four years he presided over its affairs, as well by the skill and courtesy with which he conducted our business, as by the energy and talent he brought to bear on every subject submitted for our consideration. To follow such a Chairman is a disadvantage to any one; and all I can hope is, that the efficiency of the Society will not suffer during my period of office, and that I shall deliver it over to my successor as popular and as prosperous as it now is.

Before entering upon the ordinary topics of the Address to be delivered this evening, allow me to congratulate the members on their meeting for the first time in what may almost be called a new room.

The Council believe that the alterations, which are so apparent that I need not specially refer to them, will be approved by the members, and that, whilst sitting in a more comfortable and better ventilated room, they will be pleased by the taste displayed by Mr. Crace in its decoration. The great difficulty experienced was the affording increased accommodation, and the Council found that the architectural construction of the house precluded them from making any very considerable addition to the size of the meeting-room, but they have been able, by re-arranging the seats, and making the ante-room available, to accommodate a greater number of members. In addition to the alterations in the meeting room, steps have been taken for a re-arrangement of the Society's library, which will be placed in the large room on the ground floor, where much additional convenience will be afforded to members desiring to consult the books and periodicals.

Having thus touched upon this subject, I cannot avoid saying a few words on the pictures which adorn the walls. Without having been what is technically called cleaned, they have been partially so, by the removal of much dust and dirt during the process of relining, which was found to be absolutely necessary for their preservation; and we are assured that by carefully removing that which has, by time, become more permanently fixed on the pictures, we shall be able to restore them, during the next vacation, almost to the state in which they were left by Barry in 1782. Even now the members can better appreciate than before the masterly freedom and boldness of the drawing, and the harmony of the colouring, both proving the thorough knowledge of his art which Barry had attained. Most of the members, I believe, are aware that these pictures were painted expressly for this room, and presented to the Society by Barry, the Society paying only the cost of the canvass, frames, and pigments used, which amounted to £315 2s. Upon their being finished, he asked permission of the Society to exhibit them to the public for his own benefit, which was assented to, the Society paying all the expenses attending the exhibition, which amounted to £224. The sum received from visitors does not appear to have been recorded. He died poor and discontented, his genius not being appreciated as he thought it should have been, in 1806, and was buried in St. Paul's, his body having been placed in this room the day previous to the funeral.

Following the course ordinarily adopted on these occasions, I will now call your attention to the losses the Society has sustained during the past year by the death of five members, distinguished for their position or services, and all of whom had been for years in constant intercourse and on terms of friendship with a large number of our members.

Our late President, Mr. William Tooke, F.R.S., one of our oldest members, died but a short time since, having filled every office of the Society. At one period, when great difficulties arose, and the continued existence of the Society depended on the personal exertions of one or two members, he stood forward, and by his energy and pecuniary contributions, succeeded in infusing new life into its operations. He was our honorary solicitor for a long period, and during the last few years of his life, when no longer able to attend our meetings, continued to take a lively interest in all our proceedings.

Mr. William Cubitt, M.P. for Andover, was born in 1791, and after leaving school, entered the navy, but soon withdrew from the service to join his father as builder and contractor. He was most successful in business. He served the office of Sheriff of London, in 1847, and was twice elected Lord Mayor.

Mr. Joshua Field, F.R.S., born in 1786, was educated at a boarding school at Harlow, in Essex, where, at an early age, he displayed great mechanical talent. He left school in 1802, at 16 years of age, and obtained a situation under Sir Samuel Bentham, in the machinery department of the dockyard at Portsmouth. Sir Samuel soon removed him to London, and employed him in the drawing department of the Admiralty, which he left, upon the recommendation of Sir Samuel, for employment under Mr. Maudslay, who was then constructing the block machinery for Sir Isambard Brunel. This introduction, in 1804, led to a partnership, and to a friendship which lasted uninterruptedly to Mr. Maudslay's death. Mr. Field took much interest in the *Great Western* steam-ship, designed by Mr. Brunel, which was the pioneer of the now almost daily steamboat communication with America; and the machinery the firm supplied to that ship was, at the time, the most perfect specimen of marine engineering then completed. Mr. Field took a prominent part in everything calculated to improve the profession of which he was so distinguished a member. He was one of the founders of the Institution of Civil Engineers, and filled the office of President in 1848-9. He was elected a Fellow of the Royal Society in 1832.

Mr. Joseph Glynn, F.R.S., also an engineer, though less known in London, was a valuable member of the Society, and for many years member of Council and Vice-President. His attention was principally directed to hydraulic engineering, and his works are better known in Lincolnshire and the Fen districts than here. He combined great caution with considerable constructive ability, and was successful in the pursuit of his profession.

In Mr. Mulready, R.A., the Society, and his brother artists, have lost a friend and an example. He was born at Ennis, in Ireland, in 1786, and brought to London by his parents in 1792. At a very early age he began to show a taste for drawing, and when nine years old drew with spirit. He also evinced great love of reading, and was soon noticed by the keeper of a book-stall in Covent-garden, who first lent him books, and then, observing his talent for drawing, employed him to colour prints. He used to amuse himself, at this early period of his life, by chalk writing on walls, which he did with spirit and freedom. His first step as an artist was his introduction to Banks, the sculptor, who set him to copy busts, and thus put him in a fair way of acquiring a sound knowledge of the best examples of art. Whilst with Banks he entered himself as a student at the Royal Academy, but failed to gain admittance on his first trial. In 1801, however, he succeeded, and, still working under Banks, made rapid advances, receiving from our Society the silver palette, in 1802-3, when 17 years of age. From this time he supported himself by illustrating books, in which he was eminently successful, and by scene painting. This was in 1804, when his career as a truly English painter may be said to have commenced. With the careful drawing and finish of the Dutch school, he combined a richer tone, greater freedom of treatment and execution, and more poetry and imagination. His progress was steady and uniform, proving, as years passed on, the great value and importance of that constant attendance at the life school, which he continued to the end of his life, and which, if the highest degree of excellence in Art is to be attained, is indispensable. His keen observation, his appreciation of humour, and his exquisite, we might almost say unrivalled, drawing, are visible in all his works. He was a most laborious painter—no work was turned out of hand to meet the demand of the moment—everything was not only finished, but exquisitely finished, and all those who recollect the beautiful collection of his pictures which was exhibited in this room in 1848, will not fail to acknowledge that Mulready, in his peculiar style, held the foremost place among the artists of England. His kindliness of character, his unassuming manners, and his ardent love of art, made him the friend of his patrons and brother artists, whilst his willingness to advise and assist the students at the Academy endeared him to the younger members of the profession.

Having thus paid our tribute of respect to the most distinguished of our members whom we have lost since our last Annual Meeting, I will proceed, in accordance with our Bye-laws, to indicate the policy which the Council propose to follow during the coming session.

It appears to me that in a Society like ours, the proceedings of one year, except on very special occasions, are so dependent upon those of previous years, that to fulfil the obligation imposed by the Bye-laws it is necessary to trace what has for some time past been the policy of the Society, and then to show by what means that policy, approved as it has been by successive annual meetings, is to be continued, extended, and invigorated, by the proposed arrangements for the coming year.

Looking back then for some years, we find two subjects have engrossed much of the time of your Council, and have demanded the appropriation of a large portion of your funds.

The first relates to the Exhibitions of 1851 and 1862, which, having been so frequently and so fully dwelt upon on many previous occasions, I need only mention with a view to making one observation in addition to what has been already stated, viz., that the Council will continue to collect and to record every fact which comes under their notice likely to guide their proceedings at some future time, when, no doubt, a third International Exhibition will require the exercise of that energy and spontaneous action by the Society which have so much contributed to the success of those which have passed away.

The second refers to its action in the cause of education, and especially to the education of those connected with the manufacturing industry of the country.

It is very important at this time, when principles of education, which I believe we may with truth assert, originated in discussions held in this room, are so generally approved and adopted, that the members of the Society should appreciate the exertions which it has made in this great cause, and that it should be known to whose perseverance, industry, and talent the public are mainly indebted for the success which has been achieved.

I will, therefore, although this subject has been well nigh exhausted by my predecessors, trouble you with a few observations, to show how consistently, and through a long period of years, we laboured to introduce, and have at length, we believe, firmly established, an efficacious system for testing the self-education of the artist, the mechanic, and, lastly, we hope, of the artist-workman.

You are no doubt aware that the first Exhibition of Pictures by British artists took place in the Society's house in 1760, and that from the assistance the Society afforded to artists at that time sprung the annual exhibitions by the Royal Academy, which commenced in 1768.

I have before me three letters from Frank Hayman, Chairman of the Committee of English Artists, and subsequently a Royal Academician, to the then secretary of the Society, which I will read:—

February 26th, 1760.

Sir,—The artists of this city, having resolved to raise a sum for purposes of charity by the annual exhibition of their works, entreat the Society to allow them the use of their room from the 21st of April to the 3rd of May. This favour they consider as very important. The publick concurrence of the Society will give to a new practice that countenance which novelty must always need, and the Arts will gain a dignity from the protection of those whom the world has already learned to respect.

I am, sir, your most humble servant,
F. HAYMAN,
Chairman of the Committee.

To the Secretary of the Society for the Encouragement of Arts, &c.

St. Martin's-lane, 13th May, 1760.

Sir,—You are requested by the artists whose works appeared in the late exhibition, to return their sincerest thanks to the Society for the use of their room and the honour of their patronage.

Whatever improvement the arts of elegance shall receive from the honest emulation which publick notice may excite, will be justly ascribed to those by whose example the publick has been influenced.

I am, sir, your very humble servant,
F. HAYMAN,
Chairman of the Committee.

To Dr. Templeman, Secretary to the Society for Promoting Arts, &c.

St. Martin's-lane, 9th December, 1760.

Sir,—The favour conferred last year on the Artists by the Society has encouraged them to solicit the use of their room for a second Exhibition.

This request may be now granted with less inconvenience to the Society, as the Exhibition will be deferred to the beginning of June, a month in which the meetings of the Society are more rare than in the winter, the artists being desirous that the pictures drawn for the prize should be removed, lest any man should a second time suffer the disgrace of having lost that which he never sought.

The Exhibition of last year was crowded and incommoded by the intrusion of great numbers, whose stations and education made them no proper judges of statuary or painting, and who were made idle and tumultuous by the opportunity of a shew. It is now, therefore, intended that the catalogues shall be sold for a shilling each, and none allowed to enter without a catalogue, which may serve as a ticket of admission.

These regulations, which have been very deliberately formed, will be doubtless thought expedient and useful, and the artists flatter themselves that the improvement of national taste which will be promoted by comparing the works of the different performers is not unworthy the care of the Society.

I am, sir, your most humble servant,
F. HAYMAN,
Chairman of the Committee.

To Dr. Templeman, Secretary to the Society for the Encouragement of Arts, Manufactures, &c.

In the Society's house, also, was held the first exhibition of new Inventions, about a century ago, and the models exhibited were illustrated by lectures and by *viva voce* explanations.

Here, from 1780 to the present time, prizes have been given for proficiency in various branches of art and science.

Here arose the germ of International Exhibitions; and it is not too much to say that the discussions in this room and at our Council Board, relating to International as contrasted with National Exhibitions, and in which one of our oldest members of Council, Mr. Winkworth, took a distinguished part, very much aided in preparing the public mind to receive and to appreciate the bold but enlightened scheme for an International Exhibition, which was so admirably matured and so ably advocated by our late lamented President in 1849-50.

Since 1851, the attention of the Society has been specially directed to the encouragement of the industrial education of a very large class of persons for whom no adequate provision had previously been made, and it was only by the continuous exertions and untiring perseverance of Mr. Chester and other members of our Council, that the difficulties surrounding the plan they proposed were overcome.

In 1853, when a Committee was first appointed to inquire into the state of Industrial Education, there were but three great channels of instruction—our universities, our middle-class boarding schools, and our national and British schools. There were no means by which the very large number of youths and young men who left school at 13 or 14 years of age, and became at once engaged in business, could test the knowledge they subsequently acquired by private study, or through which they could obtain such a public acknowledgment of their industry and their acquirements, as would be practically useful to them in the race for employment and advancement in after-life. Every one who hears me—having his own experience to refer to—knows the great difficulty the young men to whom I have referred must always have had in obtaining knowledge — really sound and useful knowledge—either in the hour or two in the morning before going to business, or in the evening after business. Every one knows the temptations to be resisted, the pleasures to be sacrificed, and often the ridicule to be borne, to obtain the still greater, though not so immediate pleasure, of acquiring knowledge; and yet, until this Society led the way, supported in its difficult course by the aid and counsel of the Prince Consort, no Society or Institution existed which offered to young men from 16 years of age and upwards, a wholesome stimulus to study, or gave them the means by which their industry, their perseverance, their self-culture, could be tested and acknowledged, and brought prominently before their friends and the public.

That this or some similar system for encouraging private study after leaving school had become absolutely necessary, from the universality of education, was never so apparent as now, when the attractions of sensation novels, worthless as vehicles for conveying wholesome instruction, if not absolutely injurious, by unduly exciting feelings and sentiments calculated to lower rather than to elevate the tastes and principles of their readers, and when the temptation

to devote too much time in reading the interesting and varied information contained in the daily press is considered, information conveyed in so condensed and popular a form as almost to preclude reflection, and to lead involuntarily to the adoption of the views of others rather than to the formation of individual opinions, and the tendency of which is to discourage sound and systematic study—I say that with such inducements to desultory reading, any education entered upon voluntarily, to be followed by an examination, must raise the tone of mind, elevate the thoughts, give precision to their expression, whether in writing or verbally, and induce a correctness of reasoning and of analysis, which will produce most beneficial effects in after-life.

The efforts of the Society to obtain the sanction and co-operation of the public to this novel and voluntary system of education and examination, differing so entirely from anything previously attempted, were slow, but they were sure.

Three years were spent in maturing the plan, and it was not till February, 1856, that the first regular programme was issued, nor until June of the same year that the first examination was held. There were then only fifty-two candidates. Last year there were very nearly a thousand.

Such was the effect produced by these Examinations, that strength was given to a suggestion of one of our examiners, that the Universities should do for the class immediately above those for whom our Examinations were intended—that which we were so successfully doing in our special sphere—and the result was the establishment of the middle-class Examinations of Oxford and Cambridge, success in which bids fair to be the test by which the value of the education obtained in the private schools of the country will hereafter be measured.

Many of the objections to competitive examinations among the higher classes of students, whether at the University or at the middle-class examinations, or at the examinations for civil or military appointments, do not apply to ours.

Cramming, which is now a profession, cannot be adopted by the candidates who appear before our examiners. In the first place, they cannot afford to pay for such a system, and if they could they are so spread over the country that it would be almost impossible, except in a few large towns, to obtain the necessary help; and I believe that the honours gained by our candidates must, as a whole, be more honestly won than those by any other class. The examinations are not entered upon to gain a particular position in college, or a particular office or promotion in military or naval life, by young men most of whom have more or less money at their disposal, but by those who hope to gain the notice of their employers by great sacrifices and severe labour after their day's business is over. Such men would mostly scorn cramming. They are seeking for a test of their voluntarily acquired knowledge, not simply for a pass to some place or for promotion. The effect is therefore greater; the merit is also greater; and, class for class, in the course of time the results will be greater.

I hope, then, without wishing to disparage the exertions of any other body, I have not unfairly endeavoured to maintain the claims of this Society to the honour of leading the movement for the voluntary examination of students anxious to secure some public acknowledgment of their industry and talent.

Turning now to another view of the subject, when we consider the influence that the upper stratum of the working classes exerts over the entire body, and that the working classes form the base of our industrial fabric, too high a value can scarcely be attached to every step which encourages them to attain by their independent exertions, and from books of their own selection, an acquaintance with sound principles of political economy, which will influence their own conduct and enable them to influence that of others.

Differences between masters and workmen, originating mostly in ignorance and misunderstanding, will doubtless be lessened by a certain number of young men voluntarily submitting, year after year, to a difficult examination to test the extent of their self-education, and thereby becoming able to appreciate, to understand, and to explain to their fellow workmen, the great social and economical principles on which their success depends. The accomplishment of these great objects has been for many years past the aim of our educational proceedings, and we are now endeavouring to extend their efficiency by offering prizes to artist-workmen who obtain great proficiency in their respective industries, and by the consideration of a suggestion brought under our notice by a most active and valuable member of Council, Mr. Twining, for adding to our list of subjects examinations in the technical knowledge of the various industrial operations in which intelligent workmen and foremen of works are engaged. These may be considered as the steps forward we hope to accomplish this year.

The first exhibition of specimens of wood-carving was held in June last; and a second Exhibition, consisting of specimens of art-workmanship of various kinds by workmen, will take place in this room in a few days. Both must be viewed as preliminary steps taken to test the desire of artist-workmen to compete among themselves, and quite independently of their employers, for prizes given for superior skill. They have, however, been sufficiently successful to enable us, we think, to see our way to very superior results in future.

In providing papers for our Wednesday evening meetings, we shall endeavour, as

much as possible, to select subjects interesting to our members. Arts, Manufactures, Commerce, and Agriculture, will all meet with attention during the session, but the Council would particularly urge the co-operation of the members in finding good and interesting papers to be read at these meetings. There must be many among those I see before me able to read papers full of interesting and instructive matter, the publication of which in our *Journal* would be of great utility.

Those announced for the evenings before Christmas are likely to be more than usually interesting, but, besides these papers, we have arranged three courses of lectures, by professional gentlemen, eminent in their special departments. They will be delivered on Monday or on Thursday evenings, as may be found most convenient. The first course, by Mr. G. W. Hastings, D.C.L., is on "International Law, and its Commercial Relations," and will begin before Christmas. The others, by Mr. Crace Calvert, F.R.S., and Mr. Burgess, on "Chemistry Applied to the Arts," and "Fine Arts Applied to Industry," will follow in succession. Due notice of them will be given in the *Journal.*

The expense of these courses of lectures, which will be called the "Cantor Lectures," will be defrayed out of the interest of the legacy of £5,000, bequeathed to the Society by Dr. Cantor, and the Council feel assured the members of the Society will approve of this mode of employing the income entrusted to their care.

The Council have this year, in conjunction with the College of Physicians, to award the quinquennial "Swiney Prize," consisting of a silver cup, value £100, containing a purse of £100 in gold, for the best published treatise on Jurisprudence.

The Council will also, at the end of the session, award for the first time, the Society's Gold Albert Medal for distinguished merit in Arts, Manufactures, or Commerce, the new dies for which are in progress, the likeness of the Prince Consort having been submitted for the approval of her Majesty.

The Committees already appointed, in addition to those which are continued from last year, will, we hope, do good service. Perhaps one of the most important of them, when considered in all its bearings, is that to collect the statistics of model and other dwellings for the working classes, which will endeavour to digest a large mass of statistics relating to them already collected, and, if possible, to point out the causes of failure, the means of avoiding failure in future, and the best mode of meeting one of the crying evils of the day—the want of proper and decent home accommodation for working men.

Education, missionary efforts, increased wages, will produce no sensible effect so long as men, women, and children are all huddled together, day and night, in one room. That vice should be the result of such a lamentable deficiency in our social arrangements for the poor, is not surprising, but it is a remarkable tribute to their character, that under such very adverse circumstances they should be so respectable as they are.

Two prizes, of £25 each, are placed in the hands of the Council by Mr. J. Bailey Denton, to which are added the Society's medals, to be offered for the most approved designs for cottages, to be built singly or in pairs, at a cost not exceeding £100 each. One prize is to be competed for by members of the Architectural Association, and the other is open to general competition.

Fine Art does not generally occupy much space in our annual addresses, but this season has been remarkable for the sale of a large number of our finest English pictures, and at prices which prove the annually increasing love of art among the middle classes of this country.

The Art Copyright Act of 1861, in the preparation of which this Society took so prominent a part, has, I believe, very much contributed to the rapid advance which has taken place in the value of modern pictures.

No one can doubt, who has seen the pictures which belonged to Mr. Bicknell, and others, recently sold by Messrs. Christie, that fine art in this country needs only just protection against fraudulent imitation and against the sale of pirated works; and that this should be given in the interest of both artist and purchaser, is quite consistent with the utmost freedom in the production of works of art by any means within the reach of the artist.

I cannot pass from this part of my subject without specially noticing one portion of the report of the Royal Commission on the Royal Academy. I refer to the recommendation that there should be a class added to the Academy for artist-workmen. This, I think, would, if managed with a due regard to their wants, characters, and power, be a most valuable addition to the art education of workmen, but the admission should be restricted to those who, either by competition or by the strong recommendation of their employers, have shown such an aptness in their respective trades, and so ardent a desire to improve themselves, as to ensure the useful employment of the great advantages that would, by the establishment of such a school, be offered to them.

The demand for pictures—the increasing demand for sculpture—whether for architectural embellishment or for statues in public places in our cities and country towns, show the greater appreciation of works of art in all parts of the country, and may fairly be considered as the result of the improved, and more matured and extended, art education of the present generation as compared with that of the one which preceded it.

I have now to approach two most important and interesting topics, one relating to the past and the other to the present and future operations of the Society. You have all, no doubt, observed and admired the memorial bust of His Royal Highness the Prince Consort, executed by Mr. Theed, which is placed in this room, in accordance with the resolution of the general meeting of the Society, held in March last, and we hope you will approve the manner in which the Council have carried out the views expressed by the members. Besides the bust, the pictures the subjects for which have been approved by the members, are in progress, and will, ere long, fill the vacant spaces between Barry's pictures. We shall then have before us, in sculpture and on canvass, the very best likenesses which can be obtained of the Prince Consort, as well as a portrait of Her Majesty, which, the Council feel assured, will be most gratifying to the members, and, will, we trust, keep alive in our memory the important influence His Royal Highness exerted over the prosperity of the Society, and will stimulate us to make it, now we have lost his invaluable counsel, as worthy of the distinguished support we now enjoy as it was of that we received during his presidency.

Many members present no doubt attended the meeting of the Society on the 22nd of last month, and took part in the very gratifying proceedings of that day, when we elected his Royal Highness the Prince of Wales—first a member, and then the President of this Society.

The circumstances connected with his election are full of interest, and I trust it will be the pride of the Society, as I am sure it will be its duty, so to conduct its affairs as to make it in years to come worthy of the support of His Royal Highness.

To accomplish this, we must never forget the noble and beneficent principles which were always uppermost in the mind and ever influencing the acts of the late Prince Consort. He had no sectarian prejudices. His sympathies were universal. He acknowledged the claims of every class—none were too humble for his generous solicitude. He looked upon ignorance as the depressing influence which restrained the generous feelings of all classes, and prevented their uniting to promote each other's improvement and advancement in life.

Upon the degree of comfort the working man could secure when at home with his family, and when tired with his day's work, he knew depended the cultivation of his mind during his hours of rest, and to improve and to increase this by building model cottages he devoted time and money. Upon the acknowledgment by their employers of the claims and proper position of domestic servants, he knew depended the formation of those provident habits, which would confer, when they settled in life, inestimable benefits upon their families; and their interests he advocated personally, and in most eloquent language. To the improvement of industrial education, whereby workmen might be able to increase the value of their mechanical skill by a knowledge of the principles of their art, he devoted much valuable time and thought, correctly estimating the beneficial effect which must be produced upon this large and intelligent class if they could compare, at their leisure, the results of their labour with those of the labour of foreigners; and in their interest he warmly supported the Exhibitions of 1851 and 1862. To the painter and sculptor, and all engaged in fine art, he gave the greatest encouragement, as well by the taste, judgment, and great knowledge he displayed when presiding over the Fine Arts Commission, as by the purchases he made for his private collection.

We have then a great duty to perform. We must not slacken in our exertions, but we must consistently and energetically carry out the objects for which the Society was established—moving forward and widening our sphere of action — declining to promote no good object because it is new, or in advance of public opinion at the moment—and never halting in the promotion of any means which may be suggested to elevate the mental and physical condition of the industrious classes, thus showing to Her Majesty and our Royal President our determination to carry out the beneficent views of the Prince Consort, and that we appreciate the interest Her Majesty takes in the progress and prosperity of the Society, so graciously expressed in the reply of the Prince of Wales to the address presented to him.

To this end, then, let us continue to promote those great catholic principles of art and industry which tend to unite nations, as well as the individuals of each nation, in one common bond of fellowship. Let us strive to release industry from the shackles of prejudice and ignorance—to encourage the greatest freedom for the exercise of talent, come from whence it may, and thus to maintain this Society in the foremost rank of those who are striving to extend the operation of those humanising and peaceful influences which invariably follow the cultivation of the understanding, and enable all more fully to appreciate the wondrous works of God—whether manifested in the marvellous development of life in the smallest animalculæ, visible only through the microscope, or in the grandest and most magnificent works of Creation—so that all alike may feel and acknowledge, in the words which our late President selected for the inscription on the portico of the Royal Exchange, that—

"The earth is the Lord's and the fulness thereof."

The Chairman then presented the Prince Consort's Prize to Mr. William Vaughan, to whom he addressed the following observations:—"In presenting you with the Prince Consort's Prize of 25 guineas, I have the gratification to inform the members present of the conditions which are required from those who earn this great distinction in the Annual Examinations of the Society. It is necessary that the successful Candidate shall have obtained, for four years in succession, the largest number of first-class certificates, and I have great pleasure in announcing that you have obtained the following first-class certificates:—

1860. Arithmetic—First-class Certificate (with First Prize of £5).
1861. Geometry—First-class Certificate (with First Prize of £5).
1862. Book-keeping—First-class Certificate.
,, Mensuration—First-class Certificate (with Second Prize of £3).
1863. Algebra—First-class Certificate (with First Prize of £5).
,, Trigonometry—First-class Certificate (with First Prize of £5).
,, Conic Sections—First-class Certificate (with First Prize of £5).

And I cannot help observing that, whilst studying mathematics, you did not forget the importance of obtaining knowledge which would be useful in the practical duties of life, having, in 1862, taken the first prizes in Book-keeping and Mensuration. I may mention also that, at the annual distribution in 1853, your father, then a stonemason, received a medal from the Society for 'his machine for putting together chimney-pieces.' Under these circumstances, it is very gratifying to be able to reward such continuous industry, and to mark it by handing to you the Prince Consort's Prize."

In presenting the prizes to the artist-workmen who successfully competed at the Wood Carving Exhibition, the Chairman said he trusted that the prizes he now had the pleasure to give them on behalf of the Society of Arts and the Society of Wood Carvers would only serve to stimulate them to greater exertion at the exhibition, on a larger scale, which would be held during the present session. He might mention that the Society of Arts gave £30, and the Wood Carvers' Society £15, and that the judges were Messrs. John Bell, J. G. Crace, P. Graham and M. Digby Wyatt, nominated by the Society of Arts, and Messrs. Burgess Reeve, F. Broach, and G. W. Collins, nominated by the Wood Carvers Society.

The Chairman then distributed the prizes, as follows:—

First Division. Human Figure in Alto or Bas Relief.

Animals or natural foliage may be used as accessories.

1st Prize of £8 and the Society's Silver Medal, not awarded.

2nd Prize of £4, to James Meiklejohn, 29, William-street, Regent's-park, N.W., for "Apollo playing to the Shepherds," alto relief, in oak.

3rd Prize of £3, to G. Rumford, 9, Ecclestone-street, S.W., for "The Rose-bud," child's head in limetree.

Second Division. Animal or Still Life.

Fruit, flowers, or natural foliage may be used as accessories.

1st Prize of £8, to Mark Rogers, No. 111, Tachbrook-street, Pimlico, for a Panel, in walnut wood, of Dead Game, in a wreath of oak, blackberry, fern, &c., intended for the decoration of dining-room, sideboard, or chimney-piece—modelled and carved by him.

2nd Prize of £4, to be divided between — Green and Charles Humphriss, with honourable mention to T. H. Kendall, their employer, for "Life and Death," modelled by T. H. Kendall—Executed by T. H. Kendall, — Green, and Charles Humphriss.

3rd Prize of £3, to W. Perry, 5, North Audley-street, Grosvenor-square, W., for the "Willow Wren," "Robin in the Oak" (box wood), "Thrush" (lime tree), "Nightingale and Hawthorn," "Sedge Warblers and Dragon-fly."

Third Division.

Natural foliage, fruit, or flowers, or conventional ornament in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.

1st Prize of £8, to T. H. Baylis, 69, Judd-street, for his "Casket in boxwood."

2nd Prize of £4, to T. H. Kendall, of Warwick, for "Paper Knife, Stiletto, and Christmas Box."

3rd Prize of £3, to R. Flipping, for "The Fish and Shell Panels," Portions of Sideboard, exhibited by Messrs. Gillow and Co.

Two extra Prizes were awarded by the Society of Arts of £2 each, to J. M. Leach of Louth, Lincolnshire, for a Panel for the Pilaster of a Cabinet, designed and executed by him; and to C. J. Herly, of 2, Camden-place, South-street, Taunton, for a Door Panel, designed and executed by him.

The Secretary announced that on Wednesday evening next, the 25th inst., a paper by Sir Charles Nicholson, Bart., "On New South Wales and its Commercial Resources," would be read.

SUBJECTS FOR PREMIUMS DURING THE SESSIONS 1863-64 AND 1864-65.

The Council, in issuing the subjoined List of desiderata, would urge upon the Members of the Society generally, and others, the importance of communicating detailed accounts of new processes in Arts or methods of Manufacture, of any modifications by which these may be simplified, or labour saved, and of any novel application of Raw Materials, whether previously known or not, to useful purposes. It is quite possible that some of the things here set down as to be done, may have been already accomplished, but in such cases the knowledge of them is limited. One of the objects of this Society is to elicit discussion on the subjects with which it deals, to see that nothing is concealed which may in any way tend to promote the good of all, and to record facts and opinions. The weekly meetings, and the *Journal of the Society of Arts,* afford the requisite faci-

lities for effecting this, and the Council earnestly hope that the opportunities thus given may be taken advantage of.

Patented Inventions are not excluded from receiving the Society's awards.

The Society is willing to receive communications on subjects not included in the following list, but in all cases expressly reserves the power of rewarding any communication according to its merit, or of withholding the Premium altogether.

The degree of originality and extent of suggestions for improvements will have material influence on the adjudication of the award.

In all cases a full account and description of the invention for which a premium or medal is sought must be sent to the Society.

All communications must be written on foolscap paper, on one side only, with an inch and a quarter margin. They must be accompanied by such drawings, models, or specimens, as may be necessary to illustrate the subject. The drawings should be on a sufficiently large scale to be seen from a distance when suspended on the walls of a meeting-room.

In regard to Colonial Produce of all kinds, it is absolutely necessary that a certificate from the Governor, or other qualified person, should accompany the samples sent to the Society, certifying that they really are the produce of the particular district referred to. The samples should be sufficient in quantity to enable experiments to be made, and an opinion to be formed of their quality; and it is desirable that the cost price in the district from which they are forwarded should be given. In every instance the probable extent of supply, with the average yield, if cultivated, and whether similar articles have hitherto been exported from the Colony or not, and in what quantities, should be stated.

All communications and articles intended for competition must be delivered, addressed to the Secretary, at the Society's House, free of expense, either on or before the 31st of March, 1864, or on or before the 31st of March, 1865, except where otherwise stated. In the first case they will be considered during the Session 1863-64, in the second case during the Session 1864-65. This restriction, as to the date of receipt, does not apply to articles of Colonial produce, in respect of which this list is valid until 31st December, 1865.

Any communication rewarded by the Society, or any paper read at an ordinary meeting, will be considered as the property of the Society. Should the Council delay its publication beyond twelve months after the date of its being rewarded or read, the author will be permitted to take a copy of the same, and to publish it in any way he thinks fit.

Unrewarded communications and articles must be applied for at the close of each Session, between the third Wednesday in June and the last Wednesday in July, after which the Society will be no longer responsible for their return.

By order,

P. LE NEVE FOSTER, *Secretary.*

October, 1863.

PREMIUM LIST.

SPECIAL PRIZES.

Swiney Prize.

Best Work on Jurisprudence.—Under the will of Dr. Swiney, a Silver Goblet, of the value of £100 sterling, containing gold coin to the same amount, is presented on every fifth anniversary of Dr. Swiney's death to "the author of the best published treatise on Jurisprudence."

The next award of this prize will be made on the 20th of January, 1864. Competitors for this prize should send in copies of their published works to the Secretary.

Fothergill Prize.

Under the will of Dr. Fothergill, funds are bequeathed for the offer of a medal, and "the following subjects are proposed to the Society for their consideration:—

"1. The best method of preventing destructive fires, and of detecting incendiaries.

"2. Of speedily extinguishing fires when water is scarce.

"3. Of speedily securing valuable property from the flames, and also from thieves.

"4. Of preventing or diminishing the numerous fatal disasters from fashionable muslin dresses catching fire, whether by rendering such dresses less combustible, or having constantly in readiness a large cloak of incombustible fabric composed of asbestos or amianthus, with which instantly to enwrap the whole body.

"Paper of this kind (incombustible) might preserve from fire valuable deeds and other manuscripts. A premium for the encouragement of such a manufacture is also earnestly recommended.

"The above to be varied at the Society's discretion."

On the present occasion the Society's medals are offered:—

Steam Fire Engines.—1. For the best and most efficient steam fire-engine for land use.

2. For the best and most efficient steam fire-engine capable of self-propulsion on land.

The conditions required are:—Rapidity in raising and generating steam; facility of drawing water; volume of water thrown; distance to which it can be thrown; lightness, strength, and durability.

Stock Prize.

Under the will of John Stock, funds are bequeathed for the offer of a medal for the encouragement of Drawing, Sculpture, and Architecture.

Shell Cameo.—On the present occasion the Society's medal is offered to female artists, for the best cameo designed and executed on any of the shells ordinarily used for that purpose.

Trevelyan Prize.

Preserved Fresh Meat.—The sum of £70, placed at the disposal of the Council by Sir W. C. Trevelyan, Bart., with the Society's medal, is offered for the discovery of a process for preserving fresh meat better than by any method hitherto employed, applicable to the preservation of meat in countries where it is now almost valueless, so as to render it an article of commerce and available for stores on ship-board.

Specimens, with detailed accounts of the process employed, must be sent to the Society.

DENTON PRIZES.

COTTAGES FOR THE LABOURING CLASSES.—Two prizes, of £25 each, are placed in the hands of the Council by J. Bailey Denton, Esq., to which are added the Society's medals, to be offered for the most approved designs for cottages, to be built singly or in pairs, at a cost not exceeding £100 each. One prize is to be competed for by members of the Architectural Association, and the other is open to general competition.

Detailed particulars have been issued and may be had on application to the Secretary.

The plans, drawings, and specifications, must be sent to the Society's House, not later than the 1st January, 1864.

ART WORKMANSHIP AND WOOD-CARVING EXHIBITION AND PRIZES.

Prizes are offered by the Society in these subjects, and an Exhibition will take place in 1864.

Special lists relative to this competition will be issued.

GENERAL LIST.

*** The Society's medals will be awarded for communications or discoveries in relation to the following subjects:—

1. GOLDSMITHS' WORK.—For the best essay on Ancient Goldsmiths' Work.
2. BRONZES.—For the best essay on the manufacture and casting of Bronzes, and on bronze washes.
3. MOULDS FOR METAL CASTING.—For the production of a material to be used in the formation of moulds for casting bronzes and other molten metals, so as to enable the casts to be produced without seams.
4. PIGMENTS.—For an account of the various pigments used in the Fine Arts, with suggestions for the introduction of new and improved substances.
5. SUBSTITUTE FOR WOOD BLOCKS.—For the discovery of a substitute for the blocks used by wood-engravers, so as to supersede the necessity of uniting several pieces of wood.
6. PHOTOGRAPHS ON ENAMEL. — For the best portrait obtained photographically and burnt in in enamel.
7. PHOTOGRAPHS ON CHINA.—For the production of a dessert or other service, in China or earthenware, ornamented by means of photography, and burnt in from an impression obtained, either directly from the negative, or from a transfer from a metal plate obtained directly from the photograph.
8. PHOTOGRAPHS ON GLASS.—For a table service in glass ornamented by means of photography, under similar conditions to the above.
9. PHOTOGRAPHS ON WINDOWS.—For the production commercially of ornamental glass for windows by means of vitrified photographs.
10. FLUORIC ACID.—For a substitute for fluoric acid to be used for engraving on glass, which shall be free from noxious fumes.
11. REPRODUCING DESIGNS FOR PRINTING.—For a rapid means of reproducing artistic designs or sketches. for surface printing by machinery, such process to provide for lowering portions of the work to fit it for steam printing.
12. ROLLERS FOR CALICO PRINTING.—For any important improvements in facilitating the production and economising the cost of engraving rollers for printing calicoes and other fabrics.
13. DOCTORS FOR CALICO PRINTING.—For the best material for, and form of "doctors" for calico printing machines, which shall obviate the several objections to those now in use.
14. ANILINE COLOURS.—For a means of fixing upon cotton and other fabrics all the ordinary aniline colours, so that the dyed fabric will effectually resist the action of soap and water, or cold dilute alkalies.
15. NAPHTHALINE.—For a practical process for converting the naphthaline of gas works into alizarine or madder-red.
16. TURKEY RED.—For an essay, with the results of experiments, on the manufacture of Adrianople red.
17. NEW SCARLET DYE.—For the production of a scarlet dye for cotton.
18. MUREXIDE RED.—For rendering murexide red more permanent, when exposed to the atmosphere and sulphurous vapours.
19. BLEACHING WOOL —For an account of any important improvements in the bleaching of wool.
20. LAKES FOR CARRIAGES.—For the production of cheap purple and yellow lakes, of good quality, suitable for carriage builders, &c., and not liable to fade or change colour.
21. MORDANTS.—For a treatise on the mordants employed in the dyeing of cotton, wool, and silk.
22. NEW GREEN DYE.—For an account of the "green dye from Malda," as shown in the Indian department at the International Exhibition of 1862, including original researches, giving methods of fixing the same upon cotton and other fibres and yarns.
23. GREEN WITHOUT ARSENIC.—For the manufacture of a brilliant green colour, not containing arsenic, copper, or other poisonous materials.
24. CHLOROPHYLL.—For the manufacture of chlorophyll from grasses, suitable for dyeing silk and other fabrics of a green colour.
25. GREEN DYES.—For the manufacture of green dyes from coal or wood tar.
26. ULTRAMARINE.—For an artificial ultramarine, not liable to alteration when thickened with albumen and fixed by steam.
27. COLOURS FOR DYEING, &c.—For the discovery of oxy-naphthalic acid, a preparation of chloroxy-naphthalic acid, or for a treatise on the application of Laurent's colours to dyeing and calico printing.
28. TRADE IN FOREIGN DYE STUFFS.—For an essay on the influence of the Aniline series of colours upon the trade and commerce in foreign dye stuffs.
29. THICKENING COLOURS.—For the introduction of any substance the use of which will essentially economise the cost of thickening the colours and sizes used in dyeing and dressing fabrics.
30. SUBSTITUTE FOR EGG ALBUMEN.—For a thoroughly decolorised blood albumen, or any economic and efficient substitute for egg albumen for calico printing.
31. USE FOR YOLK OF EGGS.—For a new, large, and economic use for the yolks of eggs, with particulars of the mode of preparation and preservation.
32. USES OF SEAWEED.—For the extraction from seaweed of any substance, or preparation, capable of extensive application as a dye, drug, thickening, tanning agent, or other generally useful product.
33. CLAYS.—For an account of the mode of occurrence, and of the uses of Cornish, Devonshire, and Dorsetshire clays, and the quantities annually worked.
34. ARTIFICIAL STONE AND TERRA COTTA.—For an account of the various artificial stones and Terra Cottas introduced and employed for purposes of construction, stating their properties, advantages and imperfections, and their relative cost.
35. LIGHTING AND VENTILATING MINES.—For an account of the methods at present in use in the various coal-mining districts for ventilating and lighting the mines, with suggestions for their improvement.
36. COPPER SMELTING, &c.—For an account of the various commercial copper ores, of the smelting processes, and the methods by which the precious metals can be separated from copper.
37. TIN.—For an account of the treatment of Tin, and its application in the Arts and Manufactures, and of recent discoveries of new sources of supply.

38. Wolfram.—For an account of the modes by which Wolfram can be separated from other ores; and of the uses of Tungsten in the Arts.
39. Menaccanite.—For an account of Menaccanite or Iserine, and suggestions for obtaining Titanium from these ores.
40. Titanium.—For the best essay upon Titanium, with suggestions for extracting and utilising the metal.
41. Smelting Zinc.—For an account of the processes now in use for smelting Zinc ores, with suggestions for their improvement.
42. Sulphur and Arsenic.—For the best account of the production of Sulphur and Arsenic from the metalliferous ores of the United Kingdom, with statistics of the use and export of these substances.
43. Mining Machinery.—For improvements in the machinery for dressing poor ores of tin, lead, &c.
44. Ropes for Mines.—For an account of the comparative value of chains, hemp and wire ropes, for drawing ores from mines, giving the practical result of experiments.
45. Pumping Engines.—For an account of the relative merits of the different kinds of engines used for drawing water from mines.
46. Plumbago.—For the discovery of graphite in Australia, of a quality and in quantity calculated to be commercially useful.
47. Aluminium.—For any new or improved process for the manufacture of Aluminium which by cheapening its cost may render it applicable to many purposes for which it cannot now be employed.
48. Silicium.—For the best essay upon Silicium, and its uses.
49. Melting Cast Steel.—For an easy and cheap method of melting cast steel in large masses.
50. Agricultural Steam-Engine.—For the production of an efficient agrcultural steam engine, capable of use on the farm, and of being made available as a traction-engine, either on tramways or common roads, for carrying farm produce and manure to ailway stations.
51. Regenerative Furnaces.—For the best account of the structure and application of regenerative furnaces to manufacturing purposes.
52. Brewery Plant.—For a descriptive account of improved designs for the construction and plant of breweries especially in the arrangements for boiling, cooling, hoisting, pumping, washing, attemperating, cask-washing, &c.
53. Hydraulic Engine.—For a small, simple, cheap, and effective hydraulic engine, which in connection with the ordinary water-service of towns could be applied to lifts in warehouses, driving lathes, blowing the bellows of organs, and many other purposes where steam cannot be made available.
54. Lighting Railway Carriages.—For a system of lighting railway carriages with gas, each carriage to have an independent supply equal to the duration of the oil-lamps now carried, and the system to be adaptable to existing carriages.
55. Locomotives for Tunnels.—For the best locomotive engine for working in tunnels and underground railways, so as to avoid the injurious effects of ordinary engines.
56. Railways.—For a complete and economic system of constructing railways in iron, with the necessary plant for working railways in tropical countries and the Colonies.
57. Protecting Iron.—For the invention of an efficient method of protecting iron from the action of air and water, applicable to the various forms in which iron is used as a building material generally, and also to iron ships and armour-plated vessels.
58. Unsinkable Ships.—For plans or suggestions for the construction of an efficient and seaworthy vessel, of such materials and specific gravity, that when perforated either by shot or accident, she shall still maintain her floating power.
59. Iron Ships.—For the best and most convenient method of welding together the frame-work and covering of iron vessels, so as to dispense with bolting and riveting.
60. Diving Apparatus.—For an improved diving apparatus in which divers may work free from the influence of great pressure, and at greater depths than by means of the diving bell, helmet, or other existing appliances.
61. Shoal Recorder.—For an instrument to indicate the depth of water under a ship's bottom to prevent danger when at sea or nearing land.
62. Smokeless Fuel.—For the discovery or manufacture of a new smokeless fuel, which shall not occupy more space, or be of greater weight than the fuel now in use; and shall be equal in amount of heating power, without liability to injure metals in contact with it.
63. Motive Power.—For the generation of power in sea-going vessels by any process whereby the necessity for carrying a large supply of coal may be avoided.
64. Steam Coal in Australia.—For the discovery, in any of the Australian Colonies, and the introduction into local commerce of a good steam coal. Particulars of probable quantity available, distance of mine from shipping port, and comparative heating power and cost to be furnished.
65. Electricity.—For any new process for producing or obtaining galvanic electricity, so that it may be obtained in large quantities at small cost.
66. Application of Electricity to Organs.—For the production of an organ in which, by the use of electricity or magnetism, tunes of greater length and variety than those ordinarily produced on barrel-organs may be performed mechanically.
67. Electric Weaving.—To the manufacturer who practically applies electricity to the production commercially of figured fabrics in the loom.
68. Silk Bobbin.—For a bobbin for silk, which shall possess exact uniformity of weight, be incapable of being made heavier without detection, and which will not absorb moisture. The material employed must not be liable to chip, or to affect the colour of the silk wound on it.
69. Lace Machinery.—For a mechanical substitute for hand-labour in running in the outline to figures in machine-wrought lace.
70. Woven Garments.—For the production in the loom, and introduction into commerce, of woven garments suited for soldiers, sailors, emigrants, operatives, and others, so as to economise the cost of production, and reduce the amount of hand labour.
71. Incombustible Paper.—For the production of an incombustible paper, so as to render the ledgers of commercial men, bankers, &c., indestructible by fire.
72. Dressing and Dyeing Skins.—For an account of the materials and methods at present employed in preparing and dressing skins, and the colours and treatments to which they are submitted in dyeing.
73. Dyeing and Dressing Leather.—For improvements in the method of dyeing or dressing morocco or calf leather, in such manner as to prevent the surface from cracking in working, and to render it more fit to receive the gilding required in ornamenting books, furniture, and other articles.
74. Leather Cloth.—For improvements in the manufacture of leather-cloth or artificial leather, especially in imparting strength and durability, so as to fit it for the purposes of saddlers, harness-makers, trunk-makers, shoemakers, book-binders, and others.

75. Substitute for Wool.—For any fibrous material available in large quantity and at a low price, capable of being used advantageously in textile fabrics, as a substitute for wool. The fibre should be from 1 to 6 or 8 inches in length, and suitable for being spun on the ordinary woollen or worsted machinery.

76. Substitute for Cotton or Flax.—For any new fibrous plant or substance which may be used wholly or in part as a substitute for cotton, flax, hemp, &c., or any new processes whereby useful fibres may be extracted from plants.

77. New Gums.—For any new substance or compound which may be employed as a substitute for Indian-rubber or gutta-percha in the arts and manufactures.

78. New Gums or Oils.—For any new gum or oils the produce of Africa, calculated to be useful in the arts and manufactures, and obtainable in quantity. Samples of not less than 25lbs. of gum, and 50lbs. of oil to be transmitted to the Society.

79. Elastic Tubing.—For an elastic material for tubing suited to the conveyance of gas, and not liable to be affected by alterations in temperature, or to be acted upon by the gas itself.

80. Glass.—For the production of glass by the use of the constituents of which the French sands are composed, such glass to be of a quality equal to that produced from those sands.

81. Colour for Japanned Surfaces.—For the preparation of any colour, applicable to the japanned surfaces of papier maché, that shall be free from the brightness (or glare) of the varnished colours now used, but possess the same degree of hardness and durability.

82. Colour for Slate.—For the preparation of light colours to be used in enamelling or japanning slate, which will stand the action of the heat from the fire without blistering or discoloration, and be sufficiently hard to resist scratches.

83. Japanning Zinc.—For a process whereby the surface of articles manufactured in zinc may be economically japanned.

84. Coating Walls.—For the production of a cheap white enamel-like composition for the interior walls, &c., of houses, applicable to all ordinary surfaces, easily cleansed, not liable to crumble or chip, and capable of being tinted.

85. Substitute for Turpentine.—For a new and efficient substitute for turpentine applicable to the manufacture of varnishes, and to purposes for which turpentine is now ordinarily applied.

86. Substitute for Pitch.—For a cheap substitute for pitch, tar, &c., equally impervious to air and moisture, but non-inflammable.

87. Paper Machinery.—For a portable machine for planing the bars of a rag-engine roll true when the roll is in position.

88. Paper Machinery.—For a cheap substitute for the expensive copper rolls now used in paper machines; a firm surface, not easily damaged by indentation, and not liable to oxidation is essential.

89. Paper Material.—For the best essay upon paper-making materials, with suggestions for reducing economically the more refractory ligneous substances suited for papermaking to a fibrous pulp by mechanical or chemical means.

90. Rollers for Printing Paper-hangings.—For a composition for feeding rollers for printing paper-hangings by cylinder machinery, similar in consistency and texture to the gelatine rollers used in letter-press printing, but adapted for working in water colours.

91. Paper Hangings Coloured in the Pulp.—For the manufacture of papers from coloured pulp, bearing upon them designs, either coloured or white, discharged after the manner of calico printing.

92. Lubricants.—For an account of the sources of supply, processes of manufacture, and relative value of the various lubricants employed on working machinery and rolling stock.

93. Red Oil.—For the solidification of oil by nitrous compounds, without the formation of red oil, or for the removal of the red oily body without injury to, or softening the solidified fat.

94. Improved Chemical Balance.—For the best chemical and assay balance, suitable for the use of students and experimentalists, which will (with 600 grains in each pan) show a difference of ·005 or less. To be sold at a moderate price.

95. Cheap Spectroscope.—For the best and cheapest form of spectroscope.

96. Dialysing Apparatus.—For the best and cheapest form of dialysing apparatus, capable of being packed in a small compass, but of sufficient size to aid the country practitioner in the detection of poisons and adulterations, and in the preparation and purification of salts and drugs.

97. Incombustible Wick.—For the production of an incombustible wick, suitable for oil, spirit, and other lamps.

98. Cyanogen Compounds.—For the economical production of cyanogen compounds for employment in the arts, or as manures.

99. Naphthaline.—For the discovery of a practical means of utilising naphthaline.

100. Oxygen Gas.—For a more economical process of obtaining oxygen gas than any in present use.

101. New Edible Roots.—For the discovery and introduction into this country of any new edible root useful as food for man or cattle, and capable of extensive and improved cultivation.

102. Edible Seaweeds.—For a means of rendering seaweeds generally available as a wholesome vegetable food on board ship.

103. Australian Sugar.—For the production and manufacture of not less than one ton of cane sugar, the produce of any of the Australian colonies. Details of the extent of land under cultivation, the yield of sugar per acre, and the cost of production per ton, to be furnished.

104. Australian Coffee.—For the successful introduction of coffee cultivation into any of the Australian colonies, and the production of 1 cwt. of merchantable coffee. Samples of 10 lbs. to be sent to the Society.

105. Spice Culture in Australia.—For the introduction of the nutmeg, clove, pepper, or any other useful commercial plant into the Australian colonies, and the production of not less than one cwt. of produce therefrom. Samples of at least 1 lb. of each to be sent to the Society.

106. Ailanthus Silkworm.—For the introduction of the Ailanthus silkworm into Australia, and the production of not less than one bale of silk. Samples of 1 lb. at least to be sent to the Society.

107. Flax in Australia.—For the production in any of the Australian Colonies of Flax of a good marketable quality. A sample of not less than one bale to be forwarded to the Society.

108. African Spice Plants.—For an account of the spice plants and condiments of Africa, wild or cultivated, with samples and cost.

109. Essential Oils from Australia.—For the introduction into commercial use at a moderate price of the essential oils shown at the late International Exhibition from Australia, or of any other new essential oil likely to be useful in medicine or the arts.

110. Mineral Oil from Australia.—For the manufacture in Australia of any very cheap oil from mineral or other sources, and its application to the purposes of illumination, lubricating machinery, use in the industrial arts, &c.

111. IMPROVED SUGAR MACHINERY.—For a practical report on any recent improvements in sugar machinery introduced into and adopted in the British or French Colonies, or on the Continent.

112. EMIGRANTS' DWELLINGS.—For the best essay (for the information of emigrants proceeding to new settlements,) descriptive of the means of treating existing natural products in any locality, such as earth, shells, chalks and limestones, woods, barks, grasses, &c., and applying them in the construction of dwellings. Diagrams and illustrations of the methods of applying materials should be given.

113. COLOURED STARCHES.—For the production of a series of coloured starches, which can be applied to articles of dress, such as lace, &c., without injuring or staining the fabric, but at the same time give to them the required tints, and thus render them in harmony with other portions of dress.

114. TOBACCO.—For an account of the cultivation, preparation, and manufacture of the various kinds of tobacco and the commerce therein.

STATE AID TO ART.

The speech, or rather address, of Mr. Gladstone at the laying of the foundation stone of the Wedgwood Institute—for he had taken the unusual pains first to write, and then to read, his address—having been already in *Journal*, the speech of the minister in the House of Commons more particularly responsible for the administration of the grants for promoting art, is now re-printed from the local papers. It has not yet appeared in any London journal.

The Right Hon. R. LOWE, M.P., said he begged to return thanks for the honour they had done the members of the House of Commons in remembering them on that occasion, and he thought it quite right that they should be remembered on that occasion, because it was from their munificence that they received some peculiar assistance towards the institutions of the country, like that of which the first stone had been laid that day. The House of Commons might be said to be a liberal but strict master, because, like Earl Granville, and hon. gentlemen who were present, they knew that they had a duty to perform, and that they had to do the best they could with the money of the people for the support of the various institutions of the country. They had heard, in language which they could not forget, the duty of throwing upon the state a certain amount for the promotion of the beautiful in the manufactures of the nation. That duty was incumbent on the state, because history and experience taught that a nation which had attained a high state of civilisation might exist with a deplorable taste for art if it had not the power of redeeming and regenerating itself. That duty, under the direction of the late Prince Consort, the House of Commons undertook some eleven years ago. He might state the measure that had been undertaken in order to carry out the views held by public men, though not expressed with the brilliancy and power with which that measure had been advocated that day. It appeared to the statesmen and House of Commons of that day that to meet the taste of the manufacturers of the country it was necessary to do three things. First, to establish a number of schools in the great seats of manufactures in the kingdom; secondly, to establish a normal school, or college, for the instruction of the masters of those schools; and thirdly, to collect and bring under the notice of manufacturers and the working classes of the country the most beautiful specimens of art that could be obtained from any part of the world. All those three things had been done. Ninety schools had been established, and were employed in teaching, with great fruit and profit, the working classes of the country, the beautiful in art manufactures. There was in London an excellent institution, which was entirely a national one, its object being to provide masters for the ninety schools already established, or any number that might be brought into existence; and these were collected together in South Kensington—admirable specimens of almost every kind of decorative art which the ingenuity of mankind could design. So far the House of Commons had shown proper attention to the duties imposed upon them. He thought the House of Commons had shown great munificence in providing for the manufacturers. He could speak from his own experience, and say that for five years the House had in no case refused any of the votes asked for that purpose. But they could not suppose that that could have been done without their being exposed to very considerable difficulty. It was necessary, if those institutions were to be really valuable institutions, that they should comply with the law which seemed to govern all public movements, namely, that they should be mainly self-supporting, that they should not become government creations, but that they should be supported by local energy and local liberality. And for that reason government had found it necessary not to make grants to such an extent as to relieve localities entirely from the necessity of contributing, and had found it right to require that the state should receive full value for its money. They had with that view made a recent alteration, by which they paid for results—for work actually done—and thus such money as they did pay was as assistance, and as a stimulus to improvement. And there was another difficulty with which government had to contend: that was, that whilst they wished to help forward a national work, they were subjected to a suspicion that they were only helping a metropolitan work, and that they were starving the provinces, for whose benefit that establishment was really intended. They had done all they could to guard against that. It was necessary that the seat of government should be in London, otherwise they could not command the assistance of those eminent men whom they employed. But it was also necessary that in London their examples and collections should be open to all provincial schools. In that respect they had done the utmost in their power. They had collections which were available for the use of the whole of the country at the expense of the Department; and they were willing at any time to send anything out of the Museum for the use of any school that might require it, on the easiest possible conditions. In fact, any object that might be desirable for exhibition was at the disposal of any provincial school. The only condition was that the party requiring it would see that it was safely taken care of, and the government would send it, and pay for the carriage of it back again. The object of government being to spread art as far as possible, if it were thought desirable to make the central Department more provincial, the Department would be open to receive any suggestions that might be made with that view. There were eleven metropolitan schools having precisely the same advantages as those in the provinces; and if the schools in the provinces complained that they did not receive sufficient money, he could only say let them work harder and earn more. He believed that the system was fairly launched, and they were overwhelmed with testimonials of the good effects produced on the manufactures. They had the testimony of every commissioner of the International Exhibition last year, of the improvement of art in England; and he thought that the result was due to the care taken by the Government in the matter, and the establishment of such institutions as that of which the foundation stone had been laid that day. He came there that day to offer his homage to the people of the town for having set in motion a system for making their contributions in the way of a rate. It was a great honour to the public spirit of the place; and if reflections had been made as to any little dispute amongst them, he thought this ought to be taken into consideration—that they had set a noble and brilliant example that would do credit to any town in England. They had had their institution ushered into existence with unusual *éclat*. It would always be remembered by that speech of which it had been the cause and the occasion; and he hoped

those who had the direction of it would remember that they had an obligation thrown upon them, and that in the splendour of their career they would strive to make the institution worthy of the eloquence with which it was commenced.

Fine Arts.

The working men of Leeds have determined to erect a memorial statue to the late Sir Peter Fairbairn.

ART CRITICS.—Mr. J. Rubens Powell has written to the *Athenæum* that Dr. Waagen, the director of the Royal Picture Gallery at Berlin, in his well-known work on "The Galleries and Cabinets of Art in Great Britain," when describing the pictures in Lord Normanton's Gallery at Somerly, points to a Claude "as an admirable work of the middle and best time of the master;" another Claude, he says, "takes a prominent place for richness of composition, power and transparency of foreground, tenderly graduated airy distance, and mild and warm tone of sky." Four pictures by Greuze, he says, "are all genuine and attractive." Then turning to Reynolds' works, Dr. Waagen says of "The Fortune Teller," it possesses "great power of colouring," and of the "Infant Samuel," "it is the finest example he knows of the master." Now, the Claude's, the Reynolds', and one of the "genuine" Greuze's, Mr. Powell says, are his works—copies he made for Lord Normanton—four of them from well-known works in our national collection. How does this strange wholesale mistake arise? The criticism is too minute to attribute it to off-hand carelessness, and it would be hard to assign want of knowledge. No painter of reputation could have fallen into such an error, and the judgment refers to the *technical* merits of the paintings, which any other than a professional man must judge with great difficulty. The critics do not, however, admit this, and it has just been announced by another of the class in the *Fine Arts Review* that "science, particularly applied science, is pre-eminently matter of professional concern and judgment; but, on the other hand, art is a matter of concern and judgment to all cultivated men who have turned their minds to it." So as all men's minds in our day are cultivated, all are art critics if they will only "turn their minds to it,"—an opinion which daily receives larger confirmation. Our old-fashioned authorities did not however, think so, for Northcote, R.A., says, "it is my fixed opinion that if ever there should appear in the world a memoir of an artist well given, it will be the production of an artist." He would suffer no other commentator on the man or his works; and his opinion was, in his day, looked up to with respect.

THE PARIS CORRESPONDENT of the *Daily Telegraph*, announces an interesting sale of original drawings to take place at Versailles, from the 7th to the 12th December next, which will include designs of Mansard, Le Nôtre, Le Brun, Mignard, Vandermuelen, and others, illustrating the building of Versailles.

Commerce.

SHIPBUILDING AT NANTES.—Shipbuilding continues to occupy the attention of the Nantes merchants. There are twelve shipbuilding yards, and in 1862 twenty-three vessels were constructed, in addition to three iron floating batteries of ten guns each, for the French Government, and a large iron frigate for the Italian Government, of 3,000 tons, on the banks of the Loire, opposite to the town. There are numerous building yards, in which are inscribed the names of all the ships by them constructed. A very large establishment has been formed at St. Nazaire, by a well-known firm of Greenock, for the construction of transatlantic steamers, and a huge building constructed for the accommodation of ten or twelve hundred workmen for the works. Many pieces of machinery, of the newest invention, have been introduced. Three large iron steamers are already in a forward state, and will be completed early next year. The five iron steamers for the transatlantic line, in the course of construction, will be among the largest known. The building yards serve as models, both as regards the implements and machinery for construction and the depth of water for launching vessels. An engineer of the marine department from the Arsenal of L'Orient, is stationed at St. Nazaire to superintend the works. There was no shipbuilding there before these ships were commenced, and since the immense works which have been completed and others in progress, this port, at the mouth of the Loire, appears likely to become of very great commercial importance and to prove injurious to the port of Nantes.

EXPORTS OF TAHITI.—The average quantity of cocoa-nut oil exported from Tahiti in the last seventeen years was about 250 tons per annum—but in 1861, 520 tons, of the value of £15,600, were shipped. Of mother-of-pearl shells, the average shipment in the same period was nearly 300 tons per annum, of the aggregate value of about £8,000. The average market prices free on board were £25 to £30 per ton for shells, and £26 to £30 per imperial tun for oil. A falling-off has been marked in the quantity of pearl shells lately obtained at the Paumotu group; this falling-off is attributed, by those engaged in the trade, to a growing and natural dislike on the part of the natives to engage in so severe an occupation as that of diving, when they find they are able to supply their wants by the far easier task of making cocoa-nut oil. In the production of this latter commodity a corresponding increase has consequently taken place. A considerable trade in oranges is carried on during the season (from January to July) with San Francisco, California. About 3,000,000, of the value of £4,000, are annually shipped. The shipping price, packed, is from 24s. to 28s. per thousand. This fruit grows in Tahiti and its dependency, Moori, in great abundance, without culture, and is of superior quality.

Colonies.

NEW ZEALAND INDUSTRIAL EXHIBITION.—It is stated that the proposed Industrial Exhibition for New Zealand, to be held in 1865, is receiving the general support of the colony, and there is a probability of it being a great success. It is intended to be held in Dunedin, in January, 1865, and the government of the province have come forward liberally towards the cost of the building. The governor has appointed commissioners, under the seal of the colony, in each of the provinces. Everything that is adapted to the development of the resources of the colony will find a place, and great inducements will be held out to English machinists and manufacturers to contribute.

NEW ZEALAND FLAX.—Numerous attempts have lately been made towards the successful and economical preparation of the *Phormium tenax*, or native flax. A company has been formed in England for working this fibre. The great difficulty in the way of the success of any large undertaking of this nature consists in the want of interior communication. The largest tracts of land covered with the *Phormium tenax* are in parts of the country from which the carriage to the place of shipment would be a serious item in the cost of the prepared fibre. Few have an adequate idea of the large area of ground that it takes to produce a ton of prepared fibre. Another, and by no means the least consideration, is this, that the land on which the native flax grows most luxuriantly is generally the best land, and could be cultivated to a much more profitable purpose than the growth of the *Phormium tenax*.

GOLD FIELDS.—The gold discoveries in New Zealand, more particularly in the provinces of Nelson and Otago, are rapidly extending. In Nelson some very rich deposits

have been found in the river Mangles, and the diggings on the rivers Buller and Wangapella are proving rich in the precious metal. The great drawback to the satisfactory working of the Nelson goldfields consists in the almost entire absence of roads. The country is very broken, extensive thickly wooded gorges and rugged precipitous mountains interposing enormous difficulties in the way of communication. The Nelson people are now seriously contemplating the construction of a railway to traverse the districts known to be rich in gold, copper and coal. The Coromandel goldfield, in Auckland province, languishes under the effects of the war raging in that province, and most of the miners have left until quieter times. Gold mining in Otago has, for the last three months, been seriously interrupted by the severity of the winter. But the worst part of the season is now over, and warm genial days have latterly prevailed. Mining operations are, in consequence, reviving in every direction, and the goldfields' population is in high spirits. Many new discoveries have recently been made, and the areas of the goldfields are rapidly extending. A new goldfield, about seventy miles from Dunedin, in a north-easterly direction, was discovered about three months ago, and about 5,000 persons are settled there, doing remarkably well. It is confidently anticipated that the ensuing season will prove a very brilliant one. The quantity of gold produced by the Otago goldfields during the current year is 405,831oz., and the export of the precious metal, 450,595oz. In New South Wales there has been no further development of the goldfields, and trade is rather dull. The most expansive part of the trade just now is the development of the coalfields. Many new mines have been opened, and the competition has led to a reduction in price, as well as to an improvement in quality.

Maori Ingenuity.—The natives are hard pressed for powder during the present war, and somehow or other they either procure it or they manufacture a substitute. The latest instance of their cleverness was discovered when a native woman offered a sovereign for a quantity of little trap eyelet-holes, such as ladies use in lacing, and on inquiry it turned out that the Maories required them for percussion-caps, having found that the top of a common lucifer-match inserted in the centre of these eyelet-holes answered every purpose.

Publications Issued.

The Port and Trade of London, historical, statistical, local, and general, by Charles Capper, in demy octavo, 520 pages, price 15s.—Smith and Elder.

Coins.—Mr. S. Martin, of the Stationery Office, and C. Trübner, have published the current gold and silver coins of all countries, with *fac-similes* of the coins printed in gold and silver, price £2 2s.—Trübner and Co.

King's Tables of Interest, and for calculating commission, in use at the Bank of England, price £1 1s.—Bell and Daldy.

Theory of the Foreign Exchanges, by George J. Goschen, M.P. 2nd edition, revised by the author. 8vo., pp. xv.—149, price 5s.—E. Wilson.

Marks and Monograms on Pottery and Porcelain, in demy octavo, with nearly 1,000 woodcuts, price 12s., by W. Chaffers, F.S.A.; also, by the same author, price 3s. 6d., Hall Marks on Plate, by which the date of the manufacture of English plate may be ascertained—J. Davy and Sons.

Chromotography, a treatise on colours and pigments, and of their powers in painting, by George Field. New edition, improved. 8vo., pp. xviii.—424, price 8s. 6d.—Winsor and Newton.

The Universal Decorator, a complete guide to ornamental design, &c. The illustrations by William Gibbs. 4to., price 50s.—Houlston.

Amongst the Parliamentary Papers recently published may be mentioned the Report on Ordnance, with Evidence and Diagrams, price 16s.; the Annual Report of the Commissioners of Patents, price 8d.; and An Appendix to the Report of the Royal Academy Commission, price 10d.

A History of the Trade and Manufactures of the Tyne, Wear, and Tees, comprising the papers prepared under the auspices of a Committee of Local Industry, and other documents of a similar character, read at the second meeting, in Newcastle-on-Tyne, of the British Association for the Advancement of Science, 1863. Revised and corrected by the writers. 8vo., sd., pp. ix.—194, price 3s. 6d.—Lambert (Newcastle-on-Tyne); Spon.

Cotton Trade; its bearing upon the prosperity of Great Britain and commerce of the American Republics, considered in connection with the system of negro slavery in the Confederate States, by George McHenry. 8vo., pp. lxix.—292, price 10s. 6d.—Saunders and Otley.

Handbook to the Cotton Cultivation in the Madras Presidency; exhibiting the principal contents of the various public records and other works connected with the subject, in a condensed and classified form, in accordance with a resolution of the Government of India, by J. Talboys Wheeler. With illustrations. Small post 8vo, pp. xii.—306, price 7s. 6d.—Virtue.

The Oil and Colourman, and Painters' Manual: a London serial. Conducted by Peter Thompson, 1863. 8vo., pp. 496, price 3s. 6d.—Longman.

Reed's Ship-Owners' and Ship-Masters' Handy-book, comprising tables of the proportionate rates of freight on coals, grain, &c.; the East India tonnage scales; tables of the comparative stowage of goods; corn measures of the different ports in Europe; proportionate rates of freights for Leghorn, Genoa, Trieste, and Marseilles; Lloyd's instructions for the stowage of grain cargoes at Montreal; dimensions and contracts of wine and spirit casks; Lloyd's scale of the weights of anchors, sizes of cables, &c.; value of foreign moneys in British currency, and other information useful to those engaged in maritime commerce. Second edition, revised and enlarged. Crown 8vo., sd., pp. 56, price 1s. Reed (Sunderland); C. Wilson.

Treatise on the Ventilation of Coal Mines; together with a narrative of scenes and incidents from the life of a practical miner, by Robert Scott. 8vo., sd., pp. 71, price 1s.—Lambert (Newcastle-on-Tyne); Spon.

Forthcoming Publications.

The Bible Album, illustrated by the Poets, quarto, numerous engravings, printed in tints by Edmund Evans, extra cloth, gilt sides and edges, price one guinea—Ward and Lock.

An Illustrated Edition of the Prayer-Book, in one vol., large octavo, pp. 700, printed in red and black on toned paper, at the Chiswick Press, price 15s. cloth. or price 31s. 6d. richly bound in morocco, adapted from Geofroy Tory (1525), is announced by Longmans.

Proceedings of Institutions.

Glasgow Mechanics' Institution.—On the 27th ult. the prizes and certificates of the Society of Arts, awarded at the Examination in May last to the successful candidates from this Institution, were distributed. The chair was occupied by Professor Anderson, of the University, Chairman of the Local Board. The Chairman said the number of gentlemen who presented themselves at the Examination in May amounted to 27, to whom 34 certificates had been awarded—12 being of the first class, 9

of the second class, and 13 of the third class. Having distributed the certificates and prizes, he shortly addressed the students. It would be noticed, he said, that the certificates referred to a considerable variety of subjects, thus showing that the students gave their attention to a very extensive field of knowledge. In certain respects the results of the Examination of the present year were satisfactory, but in other aspects, perhaps, the review was not so gratifying as might have been wished. On the whole, however, they had been very successful, because almost all of the students who offered themselves for examination had passed, and the majority had done so in a very satisfactory manner. The proportion of first-class certificates which had been taken was far above the average of the whole country; but he thought it right, at the same time, to say that the candidates had not come up to their own average. The candidates of the present year had not received as high honours from the Society of Arts as those of former years. Only one book prize had been awarded, whereas, in every previous Examination of candidates of he Glasgow Mechanics' Institution, there had been awarded to them a considerable number of the money prizes given by the Society. In fact, during previous years, this Institution, he might say, had carried off the lion's share of these prizes. He wished very much indeed that the same result could have been repeated at this time, but he supposed they could not expect to be always equally successful. Those who had taken the certificates had unquestionably gone through a great amount of work in a careful and studious manner; but he would caution them, and the students generally, not to rest contented with the amount of knowledge which they had acquired, but to regard it, on the contrary, as only the starting-point for further study. Mr. MORE, President of the Institution, afterwards addressed the meeting, and referred to the arduous nature of the duties gone through by the members of the Local Board. He bore testimony to the unwearied exertions of Professor Anderson the President of the Board, in promoting the interests of the students, and proposed that a vote of thanks should be awarded him for his labours during the past year. Thanks having been cordially awarded, Professor Anderson acknowledged the compliment. BAILIE COUPER then made a few concluding remarks.

WIGAN MECHANICS' INSTITUTION.—The ninth annual report says, that looking at the gloomy aspect which the town and neighbourhood wore in consequence of the painful and yet prevailing distress, the directors were led to expect a diminution in their funds. However, they are happy to state that this has not been the case, though the library exhibits a decrease in the number of books taken out as compared with last year's return. The directors are glad to find that the attention of the working-men is gradually being withdrawn from what is mere pastime, in the shape of reading, and directed to that which is both pleasing and instructive. The news-room has about the same number of subscribers as last year. A phonographic class, on Pitman's system, has been opened for members and non-members of the Institution; the latter being charged a full fee, whilst subscribers to the Institution are admitted at half-price. At the public readings the attendance has been rather better during the year, and the pecuniary result very satisfactory. The guarantee fund against loss still remains untouched. The directors have as yet made no charge for the use of the hall for these Saturday evening's entertainments. The thanks of the members are due to those ladies and gentlemen who, by their gratuitous services, have contributed to the success of the entertainments. The income was £416 16s., and there is a small balance in favour of the Institution.

Notes.

THE ROYAL DUBLIN SOCIETY'S EXHIBITION OF IRISH MANUFACTURES in 1864 is to take place coupled with the Fine Arts Exhibition. A guarantee deed, bearing the Society harmless, is to be prepared.

AT MR. MURRAY'S ANNUAL TRADE SALE, the trade subscribed for the following works, in the following numbers:—900 copies of Dr. Percy's "Metallurgy of Iron and Steel," 900 "Handbooks to Cathedrals," 900 "Life of Sir Joshua Reynolds," 1,000 Smiles' "George Stephenson," 4,200 Smiles' "Self-Help," and 10,000 Smiles' "Iron-workers and Tool makers."

SIX TRADESMEN OF PARIS have been fined 50 francs each, for sending bank-notes in unregistered letters through the Post-office.

AMALGAMATION OF THE ST. KATHERINE AND LONDON DOCKS.—Meetings of the proprietors of the above companies have been held, at which it was resolved to apply to parliament in the ensuing session for power to carry into effect certain arrangements for the amalgamation of the two companies.

DISCOVERY OF OLD ROMAN COINS.—A large number of Roman copper coins of very ancient date and of different reigns have been discovered in the vicinity of Old Sarum, on property belonging to Mr. John H. Campbell Wyndham, of the College, Salisbury. One jar contained no less than 218, another 159, and a third 140, the whole, together with the jars, being in a good state of preservation.

EXHIBITION OF DECORATION, GRAINING, MARBLING, AND WRITING.—The fourth annual exhibition of the Painters' Company will take place in June, 1864. Intention to exhibit should be notified forthwith to the Clerk of the Company. Specimens for exhibition will be received from residents in the United Kingdom between the 1st and 15th of May. The terms of exhibiting may be had at the Hall, between the hours of eleven and two, daily. In addition to the prizes of medals, &c., two money prizes of £5 each will be awarded for decorations; one arabesque, and one of the period of Louis Seize.

MEETINGS FOR THE ENSUING WEEK.

MON. ...Medical, 8½. Dr. C. H. F. Routh, "Diseases of Women and Children.—Classification of Fibrous Tumours.—Varieties, including pelvian bodies.—Intimate Structure.—Transformations, by softening, hardening, absorption, &c.
Royal Geographical, 8½. 1. Communication from Mr. Finne, relative to explorations in the river district west of the White Nile. 2. Journey of Colonel Pelly on the shore of the Persian Gulf.

TUES. ...Ethnological, 8. 1. Rev. G. Rome Hall, "On the Aboriginal occupation of North Tynedale and Western Northumberland. 2. Account of the Weddos, or Widdos," by a Tamil Native of Ceylon.
Civil Engineers, 8. 1. Discussion on Mr. Morshead's paper on "Duty of the Cornish Pumping Engines."

WED. ...Society of Arts, 8. Sir Charles Nicholson, Bart., "New South Wales, and its Commercial Resources."
British Archæological Association, 8½. 1. Mr. E. Levien, "On Unpublished MSS. relating to Meaux Abbey." 2. Mr. H. Jenkins, "On the Roman Roads mentioned in Antonine's Itinerary, as leading to and from Colchester."

THUR. ...Royal, 8½.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, November* 13*th*, 1863.]

Dated 30*th June*, 1863.

1625. J. G. Jennings, Palace-road, Lambeth, and M. L. J. Lavater, Bath-street, Newgate-street—Imp. in stoppers and lids or covers for jars, bottles, and other vessels, also in closing and fastening other articles.

Dated 3rd July, 1863.

1653. Capt. H. Broadhead, R.N., and G. Murdoch, Portsmouth—Imp. in breech-loading ordnance, and gun carriages.

Dated 12*th August*, 1863.

1993. R. Wappenstein, Manchester—A new method of preventing forgery of bankers' cheques and other documents by the use of a stamp, and a new apparatus whereby the issue of stamped documents is controlled.

Dated 31st August, 1863.

2151. A. V. Newton, 66, Chancery-lane—Imp. in the mode of, and apparatus to be used in, sewing by machinery. (A com.)

Dated 3rd September, 1863.

2177. N. Bailly, Vesoul, France—Imp. in the application of rolling friction to the axle-boxes and journals of running shafts and axletrees of machines and vehicles of all descriptions for lessening the resistance to the motion. (Partly a com.)

Dated 24th September, 1863.

2359. A. V. Newton, 66, Chancery-lane—Imp. in the manufacture of gunpowder and powder for blasting purposes. (A com.)

Dated 28th September, 1863.

2376. T. Lowe, Brighton—An improved break for railway and other carriages.

Dated 15th October, 1863.

2524. R. Bewley, jun., Uttoxeter, Staffordshire—Imp. in wrenches.
2528. H. W. Hart, Fleet-street—Imp. in apparatus for suspending T and other like fastenings, and articles to which they are applied.

Dated 17th October, 1863.

2538. S. Berrisford and W. Ainsworth, Stockport—Certain imp. in looms for weaving.

Dated 19th October, 1863.

2555. A. Budenberg, Manchester—An improved blasting powder. (A com.)

Dated 20th October, 1863.

2576. Major-General W. N. Hutchinson, Plymouth—Imp. in ordnance.

Dated 21st October, 1863.

2579. T. C. Clarkson, 56, Stamford-street, Blackfriars—Imp. in the manufacture of saddles and harness, and in materials for and in ornamenting the same, which improvements are applicable for parts of carriages, dress, and coverings for the head, and other articles.
2586. E. Alcan, King-street—An improved method of figuring and ornamenting cloths and other fabrics, and apparatus employed therein. (A com.)

Dated 22nd October, 1863.

2598. J. W. Friend, Freemantle, Southampton, and B. P. Weatherdon, Kingston-on-Thames—An improved valve and valve gear for regulating the passage or flow of fluids.
2602. J. Weems, Johnstone, Renfrew, N.B.—Imp. in machinery, apparatus, or means for drying, cleaning, and cooling grain and other vegetable products.
2603. A. Kinder, 20, Cannon-street, and J. Inglis, Ellesmere-road, Old Ford, Middlesex—Imp. in the manufacture of metallic foils, and in the apparatus to be employed therein.
2604. B. Noakes and F. J. Wood, Bermondsey—Imp. in the manufacture of metallic casks, bottles, and other similar vessels, and in machinery employed therein.

Dated 23rd October, 1863.

2621. J. L. Jurgens, 4, Noel-street, Islington—Imp. in vessels of war.
2614. A. J. Martin, 2, Vernon-terrace, Roman-road, North Bow—An improved burner for burning petroleum, paraffin, or other hydro-carbon oils, consuming the smoke without the use of a draught chimney.
2619. F. Tolhausen, 12, Southampton-buildings, Chancery-lane—An improved mechanism for regulating the working of springs. (A com.)

Dated 24th October, 1863.

2630. W. Locke and J. Warrington, Kippax, near Leeds. and W. E. Carret, W. E. Marshall, and J. Telford, Leeds—Imp. in the working and mining of coal, minerals, and earthy matters, and in the machinery, apparatus, and means to be employed therein.
2634. B. Browne, 49, King William-street—Imp. in sewing machines. (A com.)

Dated 26th October, 1863.

2636. R. Littleboy, 2, John's-terrace, St. Leonard's-road, Bromley—Imp. in the manufacture of nosebags.
2638. F. Parker, Cambridge—Imp. in carriages.
2640. S. J. Healey, Manchester—Imp. in water gauges applicable to steam boilers and other purposes.
2642. J. Nicholas, Newton, Lancashire—Imp. in treating Canadian petroleum and other mineral oils of a similar nature.
2646. A. Blake, Newport, Monmouthshire—An improved refrigerator for cooling worts for brewing, or other liquids requiring cooling, and for improving brewers' refrigerators now in use.

Dated 27th October, 1863.

2648. J. Marshall, 126, Pentonville-road—Certain imp. in the expression of oil from oil-yielding substances, and in the production of oil cake and other residuary matters.
2654. J. Hutchinson and J. Hollingworth, Dobcross, Saddleworth, Yorkshire—Imp. in means or apparatus employed in weaving.
2656. R. Smith, 24, Higher Chatham-street, Manchester—Imp. in doubling and winding machines.
2658. M. W. Carr, Knoll, Blackheath, Kent—Imp. in the manufacture of wooden sleepers for railways.

Dated 28th October, 1863.

2660. W. Wanklyn, Albion Mills, Bury, Lancashire—Imp. in apparatus for opening and conditioning cotton and other fibrous substances.
2662. A. S. Coronel, 256, High Holborn—An improved preparation of tobacco for fumigating purposes.
2664. S. Procter, Elsecar, Yorkshire—An improved instrument for extracting corks from bottles.
2665. E. Oldfield, Adelphi Iron Works, Salford—Imp. in self-acting mules for spinning and doubling cotton and other fibrous materials.
2666. H. A. Bonneville, 24, Rue du Mont Thabor, Paris—An imp. in clasps for portemonnaies, pocket books, bags, and other like uses. (A com.)
2668. J. Cavanah and J. Cavanah, 21, Parron-street, Paddington Liverpool—Imp. in machinery or apparatus for making bricks and tiles, applicable also for washing and drying clay.
2670. W. Nall, 1, Wharf-street, Leicester—Imp. in ornamenting glass and sheet gelatine.
2671. G. E. Donisthorpe, Leeds—Imp. in apparatus used when getting coal and other minerals.
2672. R. B. Jones, Limerick—Imp. in portable cooking apparatus.
2673. J. Kennedy, Whitehaven—Imp. in the construction of ships of war and other vessels, and in masting and rigging the same.
2674. R. A. Brooman, 166, Fleet-street—Imp. in instruments for taking astronomical and other observations. (A com.)

Dated 29th October, 1863.

2676. O. C. Evans, Manchester—Imp. in digging machinery.
2677. J. R. Johnson, 31, Red Lion-square—Imp. in the manufacture of lubricating compounds.
2678. J. Rawlings, Carlton-hill-east—Improved means of attaching cords to window sashes.

Dated 30th October, 1863.

2679. A. R. Le Mire Normandy, Odin-lodge, King's-road, Clapham-park—Imp. in the manufacture of playing cards.
2680. F. N. Gisborne, 3, Adelaide-place, London-bridge—An improved composition for coating ships' bottoms.
2681. J. Nash, 37, Princes-street, Leicester-square—An improved mattrass for beds.
2683. H. Cochrane, Ormesby Iron Works, Middlesborough-on-Tees, Yorkshire—Imp. in surface condensers, also applicable to the refrigeration or cooling of fluids.
2684. W. M. Neilson, Glasgow—Imp. in taps, cocks, or valves. (A com.)
2685.. W. Gadd. jun., Nottingham—Imp. in machinery or apparatus for the manufacture of bonnet and cap fronts, which imp. are also applicable to the production of ornamental effects to other trimmings for wearing apparel.
2687. M. J. Roberts, Pendarren-house, Crickhowell, Brecon—Imp. in apparatus for oiling wool.
2688. G. Rosselet, 2, Rue Sainte Appoline, Paris—Imp. in apparatus for sustaining and raising ships, applicable also as life buoys.
2689. A. Turner, Leicester, and W. E. Newton, Chancery-lane—Imp. in looms for weaving terry and cut pile fabrics, parts of which imp. are also applicable to other kinds of looms.
2691. A. Turner, Leicester—Imp. in looms for weaving.
2692. W. Verran, Penryn, Cornwall—Imp. in machinery for obtaining motive power by means of steam.
2693. H. Clow, Bland-street, Dover road—Imp. in ovens.
2694. G. F. Busbridge, East Malling Mills, Kent—Imp. in apparatus for feeding sheets of sized or unsized paper to a drying machine.
2695. J. Brigham and R. Bickerton, Berwick-on-Tweed—Imp. in reaping and mowing machines.
2696. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in the manufacture of soap. (A com.)

Dated 31st October, 1863.

2701. J. Rennie, Birmingham—Imp. in the manufacture of chandeliers, lamps, and other apparatus employed in distributing light.

Patents Sealed.

[*From Gazette, November 13th*, 1863.]

13th November.

1243. A. Heather and J. Redfern.
1245. R. Fenner & W. H. Hight,
1253. R. Bunting.
1254. H. J. Olding.
1273. F. P. Warren.
1281. R. A. Brooman.
1335. F. R. Piltz.
1379. E. J. Jarry.
1447. W. Clark.
1836. C. Beslay.

Patents on which the Stamp Duty of £50 has been Paid.

[*From Gazette, November 17th*, 1863.]

9th November.

2791. W. Robertson and J. M. Hetherington.

10th November.

2765. F. Trouve.

11th November.

2781. W. Roberts.
2855. W. Cope, W. G. Ward, and E. Cope.

12th November.

2789. R. Furnival.

14th November.

2801. P. Unwin, J. Unwin, and J. U. Askham.
2802. A. Henry.

Patents on which the Stamp Duty of £100 has been paid.

[*From Gazette, November 17th*, 1863.]

11th November.

2706. J. Billing.
2798. A. V. Newton.

14th November.

2743. J. M. Gilbert.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

No. 575.] FRIDAY, NOVEMBER 27, 1863. [Vol. XII.

Proceedings of the Society.

NOTICE TO MEMBERS.

One Hundred and Tenth Session, 1863-64.

Wednesday evening Meetings previous to Christmas. Chair taken at 8 o'clock.

December 2.—"On Magneto-Electricity, and its Application to Lighthouse Purposes." By F. H. Holmes, Esq.

December 9.—"Agricultural Progress: its Helps and its Hindrances." By J. Chalmers Morton, Esq. On this evening John Grey, Esq., of Dilston, will preside.

December 16.—"On the Economic Value of Foods, having special reference to the Dietary of the Labouring Classes." By Dr. Edward Smith, F.R.S.

Courses of Lectures (under the title of "the Cantor Lectures") on the following subjects, will be delivered during the ensuing Session:—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. Hastings, Esq., Barrister-at-Law.

Fine Arts Applied to Industry. By W. Burges, Esq.

Chemistry Applied to the Arts. By Dr. F. Crace Calvert, F.R.S.

The course by Mr. G. W. Hastings will commence at 8 o'clock, on

Monday, December 7.—"The Law of Blockade."

Two separate copies of the Lists of Subjects for Premiums are forwarded to each member with this number of the *Journal*, for distribution.

The works sent in competition for the Prizes offered to Artist Workmen will be open to the inspection of members and their friends on and after Monday next, the 30th inst.

SECOND ORDINARY MEETING.

The Second Ordinary Meeting of the One-Hundred-and-Tenth Session was held on Wednesday, the 25th inst., Samuel Gregson, Esq., M.P., Member of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Aldridge, Major	17, Cadogan-place, S.W.
Austin, Albert Duncan	Nelson, New Zealand.
Austin, Henry de Bruno	34, Up. Hyde-park-gardens, W., and Castle-hill, Ealing.
Azémar, J. C.	40, Mark-lane, E.C., and The Waldrons, Croydon, S.
Baker, Charles	15, St. Petersburgh-place, Bayswater, W.
Bulwer, William Earl Lytton	24, Portman-square, W.
Burney, G.	Tank Factory, Millwall, E.
Burt, John Mowlem	Grosvenor-house, Millbank, S.W.
Campbell, James	6, Founder's-court, Lothbury, E.C.
Carrington, S. R.	Stockport.
Cookson, Wm. Strickland	6, Lincoln's-inn, W.C.
Corderoy, John Kittle	8, Chester-place, Kennington-cross, S.
Crowther, Benjamin	Queen-street, Wakefield.
Fort, Richard	24, Queen's-gate-gardens, W., and Reed-hall, Clitheroe, Lancashire.
Haigh, Henry	Holme Vale Dye Works, Milnsbridge, near Huddersfield.
Hamel, Felix John	Custom-house, E.C., and Church-street, Stoke Newington, N.
Hancock, George	36, Carey-street, Lincoln's-inn, W.C.
Lancaster, George	50, Hanover-st., Islington, N.
Le Rendu-Hamilton, E.	3, Alma-ter., Kensington, W.
Lister, Thomas Villiers	61, Eaton-square, S.W.
Mariet, Dr., F.R.S., F.C.S.	1, Torrington-street, Russell-square, W.C.
Turner, James William, F.R.C.S.	30 and 31, Lower Phillimore-place, Kensington, W.
Voelcker, Augustus	101, Leadenhall-street, E.C.

and as Honorary Corresponding Member,

Merlato, Le Commandeur	Consul de S. M. l'Empereur d'Autriche à Tunis.

The Secretary called attention to some tin cases of meat, preserved in a raw state, according to a process just patented in this country by M. Gorges, who has an establishment in France for carrying out his system. He thought that those present, many of whom were connected with the colonies, would take an interest in this invention, which, if successful, could not fail to be of vast importance in countries where meat was abundant and cheap, and where at present animals were only valuable for their hides, wool, and tallow,

the demand for the meat being quite inadequate to the supply.

The Paper read was—

THE AUSTRALIAN COLONIES, THEIR CONDITION, RESOURCES, AND PROSPECTS.

By Sir Charles Nicholson, Bart.

In responding to the request that I should read a paper, before the members of the Society of Arts, on "The Australian Colonies, their Condition, Resources, and Prospects," I am quite conscious that I have to deal with a subject which, from its exclusively practical bearings, is rather calculated to awaken useful reflection than merely to interest and amuse for the moment those to whom it is addressed. If, however, I can succeed for a brief interval in enlisting your sympathies on subjects meriting attention from their intrinsic importance, whilst destitute of all novelty, I shall achieve all I can hope for on the present occasion.

The history of modern colonisation is essentially a prosaic one. It presents few of the wild and romantic incidents that characterise the adventures of those who at the end of the fifteenth and during the sixteenth century, first reached America or penetrated to the far East. The men who in the present day are engaged in the work of seeking for and occupying lands hitherto unknown and untenanted, for the most part secure only a languid and ephemeral interest on the part of the public in their labours, although their efforts may be really productive of far more important results, as affecting human happiness and the actual destinies of mankind, than the achievements of men with whose names and exploits the Old World is familiar.

The founding of an empire, however silent and unostentatious the process may be, is, in point of fact, a much more heroic work than the mere guidance of a state or the successful command of an army. The results of the one last for all time, and may affect the happiness of unborn millions,—the action of the other is necessarily temporary and circumscribed. The scenes, the life, and the occupation that await the man who emigrates to a new and distant land are in the first instance, and from a partial survey, far from exhilirating. He has to fix his lot in a spot—it may be at the extremity of the globe—where all the appliances of civilised life have to be created, if they have not already been called into partial existence by those who have just preceded him. The first colonist may find himself placed on the shores of a distant bay indenting some wild coast, on the banks of a stream drawing its sources from unknown regions (furnishing him with the first and greatest of all nature's gifts in a new country, "water"), or on the verge of a pathless forest, tenanted by savage men and animals. People who live in old communities, such as those of Europe, little know how much they are indebted to the 2000 years of civilisation that have passed before them—in the subjugation of nature, the clearance of forests, the drainage of land, the construction of cities, roads, bridges, churches, colleges, all the innumerable appliances of a high and progressive civilisation, the creation of successive ages, and the fruit of uninterrupted labour extending through centuries. All these, and everything appertaining to civilised life, the colonist has to build up and provide for himself. And yet it is marvellous how much man, when influenced by a resolute will, is enabled to achieve in supplying all that can minister, not only to his absolute needs, but to his comfort and his luxuries. Let a stranger disembark at some one of the larger metropolitan towns of Australia, and he will be amazed at the maturity they exhibit, at the broad and well-paved streets, the handsome edifices, public and private, that everywhere meet his eye. He will be hardly able to persuade himself that much—in some examples (as that of Melbourne), the whole of this—is the creation of a period less than that of a single generation. He will learn with pride how much has been done in so brief an interval by the indomitable energy of his countrymen, and he will not repine at the reflection that his lot has been cast in a period and amongst a race by whom so much has been attempted and so much accomplished. To an association like that of the Society of Arts, so enlightened and yet so practical in all its views, the phenomena and the fruits of Australian colonisation can hardly be regarded as wanting in scientific value or economic interest; for whilst the great settlements of the Southern hemisphere are calculated to afford happy and independent homes for ages yet to come to the surplus population of the British Islands, they in the meantime constitute the great source for the supply of the raw material upon the manipulation of which so many thousands of the operative classes here depend. The staple product of the colonies, wool, is an article the creation of which is not dependent upon a forced and unnatural state of things, like that of the slave states of America, which may be destroyed or arrested in a single moment, from causes over which this country and the British government have no control. The vast plains of Australia, and the innumerable flocks of sheep that are depastured on them, must continue to supply uninterruptedly one of the prime articles of civilised life, in the production of wool, for ages to come. A race of purely British origin, with tastes, prepossessions, and habits purely British, will long continue to form the chief customers for those articles which are the products of English industry. Take, for example, the youngest of all the colonies, Queensland,—the annual rate of consumption of British manufactured goods, for every man, woman, and child, is over £20 a head; whilst throughout America the ratio is, I believe, only some 19s. a head. The raising and the transport of the raw materials of commerce from one end of the world to the other, the conversion of these to such forms as adapt them to the requirements of man, and their redistribution over the civilised world, is a process involving the activity, the capital, and the skill of persons engaged in almost every variety of industrial occupation—the farmer, the grazier, the ship-builder, the sailor, the weaver, the engineer. When Napoleon said that the great elements of national prosperity were ships, colonies, and commerce, he might, with equal emphasis, have said simply, "colonies;" for the establishment, the growth, the intercourse between them and the parent state necessarily presuppose shipping and trade. These are views the truth of which I may safely assume are fully acquiesced in by such an audience as that which I have now the honour to address, and I will therefore, without further preface, proceed with what I propose as the main subject of this evening's paper.

It would be wearisome, and not very profitable, were I to enter into a dry narrative of the history of colonisation, or present you with long arrays of statistics, all of which you can get from books, and very few of which you would probably recollect after leaving this room. My aim therefore will be rather to tell you what the colonies are, to communicate some general idea of their physical character and capabilities, their social and economic aspects, the prospects they hold out to settlers, and finally to give you, as far as I can, opinions founded upon personal experience and observation in connection with these several heads.

You are all familiar with the great outlines of the Australian continent, and the islands adjacent including New Zealand, as delineated in the maps of the southern hemisphere. The existence of these great southern lands was first obscurely made known to Europe about the end of the sixteenth or beginning of the seventeenth century. It was not until Cook, in his second voyage, had explored the whole of the eastern coast—to which he gave the name of New South Wales—that any correct idea was obtained of the geographical extent or peculiar productions of New Holland. There are perhaps few men of whom England may be more justly proud than of this illustrious

navigator. Cook was accompanied by two eminent naturalists, Banks and Solander. The partial observations and collections which they were enabled to make, revealed to them the existence of what might almost be considered a new world. They discovered animals and plants, differing from those hitherto known, and presenting few affinities with the Fauna or Flora of the old world or of America. So isolated, so peculiar, and characteristic did these appear to be, that the wildest speculations were indulged in to account for the phenomenon. Blumenbach explained the existence of those exceptional forms of plants and animals by the strange supposition that our planet must have been brought, on some occasion or other, into collision with some comet or great sidereal body, and that the latter had left a portion of its contents impressed on the southern side of our globe. Without reference to such a vague hypothesis, the fact appeared to be established, that in the great antipodean region, which it was suggested should be called the fifth quarter or division of the earth, there seemed to exist as it were a special creation of plants and animals curiously fashioned after a type that separated them from the rest of the world. The interest excited by these discoveries was chiefly of a scientific and speculative kind. No practical effort was made to turn the discoveries of Cook to account until after the conclusion of the American war, when the British government, no longer able to transport its criminals to North America, was under the necessity of providing some other spot, under its own jurisdiction, for the reception of those convicted of offences against the law. It is customary amongst American historians to ignore the fact that, for probably a full century before they acquired their political independence, the 13 provinces had to all intents and purposes been the penal settlements of the British empire. The criminal records of England show this; and it is only necessary to refer to a volume of the *Annual Register*, or to the *Gentleman's Magazine* of the middle of the last century, to see that deportation to the British plantations of America was the ordinary punishment for all such of the graver offences as, under the sanguinary code that then prevailed, were not visited with death. Virginia and the Southern States were those to which convicts were for the most part transported. The cessation of this outlet led to the establishment of the penal colony of New South Wales. On the 18th, 19th, and 20th of January, 1788, nearly 76 years ago, the first Europeans, destined to become the permanent occupants of the country, landed at Botany Bay. They consisted of 850 prisoners of both sexes; of a military guard, a portion of which were accompanied by their wives and families; and the necessary civil establishment of a governor and staff. A more forlorn and desolate scene can scarcely be imagined than that presented by this first band of wayworn travellers on their reaching the shores of that savage and then all but unknown land. The party may be said to have consisted simply of prisoners and their jailers. Many of the former had, almost unwillingly, exchanged death itself for the terrors of expatriation to a distant and inhospitable wilderness, from which no hope of return to the land that had cast them forth could ever be anticipated. Between seven and eight months had elapsed in the tedious voyage, and disease had thinned their ranks. Let us pause for a moment, and contemplate the condition of Australia on the 20th of January, 1788, and on the anniversary of that day in 1862. A group of men, women, and children are seen scattered and encamped on the shores of a wide bay, hemmed in by the margin of a sombre and dense forest. Despair, repentance, hope must alternately have agitated the breasts of many seated, on that eventful day, on that lonely strand. In 75 short years, within the lifetime and memory of many still amonst us, what do we see? The 1,100 people have grown into a community of 1,300,000 souls. The weary voyage, which then occupied seven or eight months, can now be accomplished in as many weeks. The morass surrounding the shores of Botany Bay, on the margin of which for a few days they first encamped, is now within the sound and sight of a splendid city, mustering one hundred thousand inhabitants, and containing within its precincts many of the attributes of a rich and luxurious capital. The smoke and the rattle of steam carriages and locomotives are seen and heard on that spot, the silence and the solitude of which had been unbroken since the first dawn of creation, save by the war-cry or the song of the aboriginal native. It is a singular fact that the first portion of land cleared from the indigenous timber, and I believe the first spot on which a plough entered the soil, was identically that selected 60 years afterwards as the site of a magnificent pile of buildings for the first university ever established in Australia. It seems a striking and a happy coincidence, that the supply of the material element for the sustenance of the physical body, should thus become the antetype of that higher provision for the intellectual wants and moral requirements of the race that was so soon to follow.

The first aspect presented by the unknown land on the coast of which they then found themselves was forbidding. Sir Joseph Banks, in his report, had spoken of smiling and luxuriant meadows as skirting the shores of Botany Bay. These turned out, on examination, to be a mere swamp, covered with low and useless but beautifully flowering shrubs. The adjacent country consisted of stony, sterile ridges, or dense and sombre forests of the *Eucalyptus*, After a few days the first encampment was abandoned, and on the 26th of January, which is celebrated as the birthday of the colony, the whole settlement was transferred to a point about six miles further to the north, to the shores of Port Jackson, where Sydney now stands.

I will not detain you with a narrative of the trials and vicissitudes which the young community had to undergo; the harsh and occasionally capricious, but, upon the whole, judicious policy which was applied to the government of the prisoner population; the gradual and progressive exploration and occupation of the coast and of the interior country. For a considerable period the knowledge acquired by the settlers of the latter did not extend far from their principal encampment, and was confined to a radius of a few miles from what is now the site of the city of Sydney. The River Hunter and its tributaries were then explored, and their rich alluvial banks gradually taken up and cultivated. For a long period all attempts to explore to the westward were arrested by a range of mountains extending along the whole of the eastern side of Australia, from Cape York to Gipps Land, and it was not till 1813 that this great barrier was surmounted, and the interior plains beyond them discovered. They were named "the Bathurst plains." The sources of rivers flowing to the west and south were here, for the first time, fallen in with, and were designated as the "Lachlan" and the "Macquarie." They were traced for several hundred miles to the west, and were found connecting themselves with other streams flowing from the north. In endeavouring to extend his exploration, Lieut. Oxley, the Surveyor-General, found the whole country under water, and he returned with the impression of there being a great central lake or inland sea, an opinion which prevailed for many years, until the rivers were finally traced to their junction with the Morrumbidgee and the Murray, large streams, coming from eastern and south-eastern portions of the territory. The great system of rivers prevailing in Eastern Australia was finally followed out and made known through the researches of Messrs. Hovell and Hume, Captain Sturt, Sir Thomas Mitchell, and others. A large and magnificent tract of country, that of Port Phillip, was opened in 1836, by Governor Sir Richard Bourke, and subsequently, in 1850, erected into a separate dependency of the British crown, under the name of "Victoria." About the same period (1836) South Australia was established, and, after a short and struggling infancy, soon became a flourishing settlement. Van Dieman's Land, originally an offshoot from New South Wales, had been placed under the administration of a separate government as early as 1824.

Western Australia, established in 1829, has been the least progressive of all the Australian settlements. It possesses but one good harbour; the soil is barren, unproductive, and badly watered. Its chief advantages will probably be found to consist in its mineral riches. It is at present a penal settlement. The proposal to perpetuate the convict character, and augment the number of convicts transported from the United Kingdom to this part of the world, has created feelings of great indignation on the part of the inhabitants of the free settlements, and given rise to very strong remonstrances on the subject. It is felt, and the conviction is universal, that on the completion of their sentences nearly the whole of those who have been transported to Western Australia will find their way to the neighbouring colonies; that it is neither just to the latter nor to the free settlers who may hereafter resort to them, that they should receive the refuse criminal population of Britain. It is demonstrable that there will be a fixed relation between the number of convict *expirés*, who, on the completion of their sentences, will leave Western Australia for the eastern settlements, and of those who may be sent there from Europe. The high wages, the temptations afforded by a fertile territory over a barren and unproductive one, the desire to obliterate the recollections of a former career, will all tend irresistibly to produce this migration. There is a positive and universal determination on the part of all the free Australian settlements to resist the evil here complained of, and it is to be hoped that the Imperial Government will so mould its policy as not needlessly to provoke a feeling of hostility and determined resistance on almost the only single question in which any possible difference can arise between England and her southern dependencies.

New South Wales may justly be considered, if not as the actual parent of, yet as intimately connected with, the origination of all the Australian settlements. Half a century had not elapsed from her foundation when we find her in possession of a population of somewhere about 80,000 souls. Agriculture, grazing, and pastoral pursuits had occupied the chief attention of the early settlers. The labour of the convicts had been usefully applied in public works, in the clearance and enclosure of lands, and in the tending of sheep and cattle. These latter had increased in a marvellous ratio. In 1848, just sixty years from the foundation of the colony the number of sheep had increased to 11,660,819, and of horned cattle to 1,752,832. The export of wool, which in 1807 had only been 245lbs. in weight, had in 40 years increased to 22,969,711 lbs., of the declared export value of £1,240,144 sterling. This may be regarded as the product of a few score pure merino sheep that had, in anticipation of their suitability to the Australian climate, been introduced into the colony by an enterprising and far-seeing colonist, the late John Macarthur, Esq. When, therefore, South Australia and Port Phillip were constituted, the one as an independent colony, the other as a mere extension of New South Wales, all that the promoters and actual pioneers of these places had to do was the comparatively easy task of purchasing and driving away from the older settlements the cattle and sheep wherewith to stock their runs. There is a disposition to ignore this filiation—this dependency of the newer colonies, and their derivation from the more ancient one. The relationship nevertheless exists. It was one in its origin mutually beneficial to all parties, and readily accounts for the rapid growth and early maturity of Victoria and South Australia, the former of which became politically independent of New South Wales in 1850. The last subdivision of the great Australian territory was made by the severance, from the dominion of New South Wales of the vast territory now designated Queensland, and which comprises an area as large as that of two or three of the largest European states. This, the youngest dependency of the British crown, has taken a start in colonisation that justifies the anticipation that she will soon rival, if not surpass, in her onward progress, all the other Australian colonies.

You will perhaps, however, be impatient that I should give you some specific details of the aspect, the character, the capabilities, of this great group of settlements formed by our own Anglo-Saxon brothers in the great south land, and may desire to learn what the specialities of each may be with reference to the question of emigration from these shores. I will endeavour to meet such an inquiry by presenting to you a few general observations on the physical geography of the countries we are talking about. These will serve to suggest some remarks on their economic capabilities. And, lastly, I shall add a few observations on the social condition of the colonies, their future prospects, and advantages as fields for European settlers.

If you will cast your eye on the map against the wall you will recognise the great island (if it may be so called) of New Holland, occupying a large space on the southern side of the world. Its greatest diameter from east to west is about 2,600 miles; from north to south (including the island of Tasmania) about 2,450 miles. The east coast reaches from Cape York, in latitude 11° S. to about 43° S. Eastern Australia may thus be said to possess a range of climate as great as and not dissimilar from that found in a zone the northern limit of which would be Central France, and the southern the Cape Verd Islands. In absolute length the eastern side of Australia is nearly as long as the western side of Europe—that is from Cape North to Cape St. Vincent. In mentioning this fact you will at once recognise how varied the climate, how diversified the productions of this great country must be, in which you have continuous regions with a gradual transition from the temperature and climate of Northern Africa to that of Devonshire or Central France. All the products of the Old World are, accordingly, capable of being produced in the corresponding parallel of the region we are describing. In intertropical Australia cotton, sugar, rice, and all the ordinary fruits, and vegetable productions of India, tropical Africa and America may readily be raised. In the regions immediately to the south, and with the climate of Morocco and Spain—the plantain, vine, orange, pomegranate, and a great variety of fruits indigenous to China, thrive luxuriantly, whilst still farther to the south, wheat and all the cereals of Central Europe find appropriate habitats. Few portions of the earth may perhaps be said to be more favourably situated. Balanced, as it were, on the tropic of Capricorn, the lesser and northern half lies within the torrid, the southern and larger section within the temperate zone. Although stretching 11 degrees within the tropic, the climate is tempered by the insular character of the land, and, so far as experience hitherto goes, Tropical Australia is most healthy. Malarious fevers, and the diseases peculiar to tropical climates are unknown. The summer heats along the coast are mitigated by the sea breeze and the trade wind. On the table land of the interior, the solar heat is often great, indeed excessive. It has the peculiarity, however, of being dry, presenting in this quality a striking contrast to the oppressive heat of India, and it is never sufficiently great to prevent exercise in the open air during the hottest seasons.

Physical Geography.—So far as the configuration of its surface has been ascertained, Australia may be said to consist of a large plain, somewhat depressed in its centre, and surrounded by ranges of mountains and hills of moderate elevation. The largest and best known of the mountain ranges is that of the eastern cordillera, the Blue Mountains, which attains its highest altitude (about 8,000 feet) in Gipps Land, and extends from Cape York, in the north, to Cape Howe, in the south, a distance of some 2,000 miles. A few spurs are detached from this great eastern barrier, the ordinary elevation of which does not in general exceed 5,000 feet. For the most part the great eastern cordillera springs from a base about 50 miles from the coast line. The great difficulty with all the early settlers was to surmount this lofty rampart, shutting them out as it were from the interior. When once they had gained its summit, they found themselves

on an immense plateau gradually sinking towards the west. The descent is, however, so gradual that the rivers that flow along it are sluggish, and their progress often imperceptible. Frequently they are mere long lagoons, only flowing in continuous streams after heavy floods. Occasionally these plains are broken by isolated hills, or mountain masses. Generally the physiognomy of the interior is one unbroken, undulating plain, sometimes of open grassy downs, at others of lightly-timbered forest, and occasionally of dense copses of thick impenetrable scrub. The scenery is generally tame, and wearisomely monotonous, although patches occasionally present themselves of great sylvan beauty, that carry the memory back to the woodlands and meadows of England. Substitute grass for heather, and the wolds of Yorkshire, the downs of Wiltshire and Sussex, would, with a bright sun, give you a perfect idea of nine-tenths of the interior plains and sheep runs of Australia. On the eastern side of the dividing range the scenery is much bolder. Waterfalls, dense forests, deep and rocky glens there prevail. The climate is less salubrious, although proximity to the sea coast renders the acquisition of land in such positions an object of importance to those engaged in agricultural pursuits.

The configuration of mountain chains, in all parts of the world, determines the system and course of rivers. Looking at Eastern Australia, you perceive two great systems of waters, that on the east and that on the west of the great backbone of the country. All the streams on the western acclivity find their way to the south by the Murray, and those on the north by a number of streams flowing into the Gulf of Carpentaria. The Murray, with its affluents, drains an enormous area. Its embouchure is at Lake Alexandrina, and, unluckily, a bar of sand separates this salt-water basin from the sea, so that vessels, except occasionally, and such as are of small draft, are unable to cross over it. There is, however, an extensive system of inland navigation now carried on on the Murray, the Darling, and the Morrumbidgee rivers. Steamers traverse these streams, and, at certain seasons of the year, reach points on their banks many hundreds of miles from the principal estuary. The country through which the great southern system of rivers finds its way to the ocean consists of immense, and to the eye boundless, alluvial flats. These are partially submerged during a portion of the year, when the river becomes swollen by the melting of the snow on the Alpine ranges of Gipps Land (from whence the southern affluents take their course), and by the rains of the vernal equinox. The sudden rising occasioned by the latter is often productive of disastrous consequences. Some of the rivers, as the Morrumbidgee, are known to have risen as much as 100 feet in a single night, and to have suddenly swept away whole villages with their inhabitants. Such catastrophes are generally the result of want of foresight on the part of the government, and may be guarded against by a more judicious selection of the sites reserved for townships.

On the eastern side of the Blue Mountain ranges the rivers are shorter in length and more rapid in their course to the sea than those on the opposite or western side. Unfortunately, scarcely any of the rivers of Eastern Australia are accessible from the ocean by large vessels, owing to the existence of bars at their entrance. One of the largest and most important of the rivers of Eastern Australia is the FitzRoy, which empties its waters into Keppel Bay, in lat. 23 deg. 30m. S. Owing to a local depression in the coast range at this particular point, the FitzRoy drains a larger tract of country (one the area of which is not less than that of all England and Wales)—than any other of the Eastern waters. It is navigable for vessels drawing from 12 to 14 feet of water, to a point 50 miles from its mouth, and in the greater part of its course it flows through one of the most fertile and promising regions hitherto opened up in this part of the world.

Having thus cursorily glanced at the general configuration, the rivers, and the climate, I may add a few details respecting the geology of Australia and its mineral resources, these latter having acquired an importance within the last few years beyond those of any other region of the earth, with the single exception of California. Within 10 years the produce of gold from Victoria alone has probably not been less than 100 millions sterling; including that from New South Wales, the aggregate quantity is probably not very far from 125 millions sterling. Copper mines have also been worked very largely in South Australia, whilst iron and coal are found in almost unlimited quantities. The great central axis, extending, as I have pointed out, through a belt of 30 degrees, consists of a series of rocks, most of which would, in the language of British geologists, be included under the designation of "primitive," "silurian," "early metamorphic," and "early carboniferous." There are, perhaps, scarcely any recognisable deposits of an age intermediate between the latter (the carboniferous) and the newest tertiary deposits, many of which contain fossil remains analogous to and identical with those still living on the same spot. The distinctive peculiarity of the greater number of the Australian mammalia is that the female is furnished with a pouch or bag, in which she carries her young. This anomalous organisation seems to have prevailed almost to the exclusion of any other, and to have been so persistent and universal, that in all the fossil mammalia discovered in Australia the same type is found; and as in England and other parts of the world, the remains of extinct species of animals, often of gigantic proportions, are found entombed in the soil on which they once lived, so in Australia we find in the newer tertiary deposits the bones of extinct animals of colossal proportions. One of these, named the *Diprotodon* by Professor Owen, by whom it has been described, must have been as large as the Indian elephant. It has, however, the peculiarity common to other known Australian mammals of being a marsupial. As many of those whom I am now addressing are aware, the remains of animals of the same organic type are found in a fossil state in England, where they seem to have preceded and ushered in higher forms of the mammalian order. These remains are chiefly found in the Oxford slate, and there is, I believe, no question as to their real character, their physiological affinity with the living forms now found in New Holland. A curious and unavoidable inference seems to follow. The marsupial animals of England have long since perished, having been succeeded by other and higher forms of mammals. No similar progression has marked the living organisms of Australia; and we probably see still perpetuated there animals bearing the closest affinity with those that inhabited the centre of England countless ages ago, before the great chalk deposits and all the great superincumbent tertiary strata had been formed. Another example of a living analogue of an extinct European form is presented in the *Cestracion Philippi*, or Port Jackson shark; whilst many of the living species of the vegetable kingdom—such as the *Cycadeæ* and *Araucariæ*—appear to be survivors of a flora that prevailed in Europe during the period of the formation of the coal deposits and the rocks succeeding them.

The central nucleus of the great dividing range is granite, resting upon which are gneiss, mica slate, clay slate crystalline limestone, and quartzose rocks. These are frequently found broken up and disturbed by the intrusion of porphyritic and trap rocks. It is in such positions that gold is generally to be found. The attrition of the rocks containing the precious metal appears to have gone on during a countless lapse of ages, the gold always occupying the lowest level, from its superior gravity, in the mingled detritus in which it is discovered. It is in this condition that it is most easily found and worked. The thickness of the alluvium beneath which the auriferous treasure lies is sometimes enormous, often as much as 300 or 400 feet. In some instances, layers of what appear to be volcanic tufa have to be passed through, showing that volcanoes have been in a state of activity at periods subsequent to that in which the precious metal acquired its present relative position. The foci from whence these

volcanic products have been derived, is still traceable in numerous conical hills, on the summits of which ancient craters are discernible. The rule laid down by Sir Roderick Murchison respecting the "constants" of gold, are, I believe, thoroughly verified by colonial experience—that is, the juxtaposition of early crystalline, quartzose and metamorphic deposits, with trappean and porphyritic rocks. The diggings in Australia are unquestionably exhausting all the alluvial gold, and science and capital are now being systematically directed to the extraction of the ore from its original matrix, or native site in quartz veins, from the disintegration of which all alluvial gold must, at some time or other, have originally been derived. Silver mines have recently been worked to some extent, and afford a promise of yielding a profitable return. The ore is found under conditions similar to those presented by auriferous veins. Copper ore has been found in some favoured spots, yielding larger profits, perhaps, than any operations connected with gold. The Burra Burra mine is a striking example of this. The quantity of ore at first yielded was, I believe, so large, that for a considerable time all the original shareholders received back the full amount of their paid-up capital every six weeks. Advices have lately reached England that copper mines promising to rival in richness Burra Burra have recently been opened out at Peak Downs, in Central Queensland.

Of all the mineral resources of the colonies, the most valuable perhaps is coal. The auriferous region is skirted at the east and north-east by a coal basin, the largest diameter of which is probably not less than 600 miles, occupying an area as large as that of Great Britain. In the possession of this great coal-field New South Wales enjoys a special advantage over all the other colonies.

To complete the hasty outline, I may add a few remarks on the aboriginal natives and the indigenous fauna of Australia. The former present perhaps one of the lowest types of humanity to be anywhere found. Their numbers are small, and they are rapidly becoming extinct. Of the aborigines of Tasmania, four only were known to be living three years since. In the colony of Victoria, when the last census was taken, their number was 1760, and in the older settlements you may travel for hundreds of miles without meeting with a single native black, and that in districts where, within a few years, they existed in great numbers, and were often troublesome to the European invaders of their soil. At the present moment they are only found in numerous tribes in Queensland, and in regions yet unoccupied by the white man. On the first contact of the two races resistance is shown to the intruder, and occasionally painful outrages are perpetrated by the blacks, bringing down speedy, and, too often, indiscriminate retaliation upon the offending tribes. I regret to add my conviction that it is an utterly hopeless task to seek to effect any real amelioration in the material or moral condition of this degraded race. They appear unsusceptible of all permanent civilising influences, and are, indeed, so rapidly dying out that little opportunity is afforded of attempting their reclamation to the habits of civilised life. They are, however, often found to be possessed of kindly instincts, and manifest strong attachments to particular individuals amongst the Europeans. In intellect they are never more than children, and the true and most humane policy with respect to them is always to regard them as such.

The native animals are not numerous. The largest is the kangaroo, a timid and graceful creature. The larger species is rapidly disappearing from the neighbourhood of the settlements, as is also the emu. Of the gay-plumaged birds and curious insects of Australia, illustrative specimens are to be seen in nearly all large museums. The only noxious or troublesome animals are the snakes, the bite of some one or two of which is dangerous.

The geographical position and mineralogical character of every country must necessarily determine the nature of its products. Of the mineral resources of the great Australian continent I have already spoken. The immense interior plains, like the steppes of Asia or pampas of America, must for ages continue to be occupied as the grazing ground of flocks of sheep and herds of cattle, whilst the more broken and hilly or mountainous country, near the sea-board, will be the site of towns and cities and aggregations of people devoted to various handicraft and industrial pursuits. The vegetable productions present all the variety belonging to the great range of climate that these colonies possess. I have seen growing on the banks of the FitzRoy river, with a luxuriance that cannot be surpassed, various species of cotton, the sugar-cane, the tea and coffee plants, tobacco, arrowroot, different varieties of the *Ficus* or india-rubber-bearing trees; in short, all the productions of tropical or semi-tropical zones. A little further to the south, in the parallel of Sydney, the grape, orange, melon, peach, and various kinds of Chinese and South American fruits, such as the leechee and the cheramoya, abound; whilst in the more elevated table-lands of New South Wales, in Victoria, and in Van Dieman's Land, all the English cereals, fruits, and culinary vegetables attain a growth and a prolific power never surpassed in Europe.

Of the indigenous timber and building materials the extent is practically unlimited. Some of the varieties of *Eucalyptus* attain colossal proportions. In the deep gorges of Tasmania trees from 280 to 300 feet high have frequently been hewn down. The timber of many of the trees is as compact and as durable as that of the Indian teak. The blue gum and iron bark have already been extensively employed in colonial shipbuilding, and might doubtlessly form a valuable substitute for English oak in the British dockyards. They have, to some extent, become an article of export.

Various kinds of freestone and marble, some of the latter of highly ornamental description, abound in various quarters along the great eastern and southern ranges. The former has been employed very generally in the public buildings and domestic architecture of the cities and towns. Timber and bark are the materials out of which the squatter's hut and the dwellings of the agriculturists are chiefly constructed. Some of the buildings erected in Sydney and Melbourne might vie with those of the older European capitals; and are, I apprehend, superior to any that can be shown in America.

The principal exports, those upon which the Australians depend, are gold, to a limited extent silver and antimony, copper, the latter being chiefly derived from South Australia, and coal. Iron ore, which exists in unlimited quantities, associated with coal, is at the present moment valueless from the cost of labour necessarily incurred in its reduction. Wool, hides, tallow, bark used for tanning, copper, and coal, constitute with the precious metal the great exports of the Australian colonies. Amongst products that may be hereafter raised and in relation to which the most sanguine expectations are formed, may be mentioned cotton. The plant itself grows with amazing rapidity, and from the absence of frosts in the northern parts of Queensland becomes perennial.

Sugar, of which there is an immense consumption, will probably ere long be raised by colonial enterprise. The difficulty attending the development of every new species of industry in these young and thriving communities arises from the insufficiency and high price of labour. With the command of this, there seems scarcely any limit to the extent or variety of objects they are capable of producing. With a scanty population and highly remunerated labour, that species of industry is most largely followed in which the product is large, having relation to the cost of production. Thus the labour of one man will on the average suffice for taking care of 1,000 sheep occupying an area of eight or ten square miles, and he may have intrusted to his charge property worth a thousand pounds sterling, and yielding a large annual exportable product. I mention this as illustrating the reason why the primary and main object of industry in these new lands is one the aim of which is to evoke the natural ca-

pabilities of the soil, and render them available in the conversion of the indigenous grasses into wool, mutton, beef, tallow, and hides. The extended application of labour to the various processes of agriculture succeeds the nomadic pursuits of the first settler, and in the older colonies, especially in Van Dieman's Land and South Australia, large quantities of cereal produce are raised annually.

In any sketch of the Australian colonies, however rapid and imperfect it may be, it is necessary to say something respecting climate and vital statistics. Health and longevity are, of course, influenced by geographical position; and in a country where you have every variety of climate, from that of Africa to that of France, different degrees of salubrity will doubtless be found to characterise different parallels in that extended area. In the portions of the country in which population has established itself it has been almost uniformly found that all the conditions are favourable to health, prolonged life, and increase of births. By the last statistical return of New South Wales, the following results are established:—

Rates of Marriage, Birth, and Death, in New South Wales, England, Scotland, and France.

To 1000 Persons living.

	Persons married.	Births.	Deaths.
New South Wales	18·54	42·18	17·25
England	16·70	34·27	22·11
Scotland	13·57	34·25	20·87
France	16·17	26·50	27·67

The comparison is, in all respects, favourable to the colony, the marriages being more numerous in proportion to the number of inhabitants, the birth-rate higher and the death-rate lower, than in England, Scotland, or France. France gives 26, Great Britain 34, births to each thousand, while New South Wales gives 42. In France the mortality is nearly 27 per thousand, in England 22, in New South Wales 17¼. Of 100,000 persons living in the respective countries, there are married in the colony in a year 184 more than in England, 237 more than in France, 497 more than in Scotland. To the same number living there are 792 births in New South Wales more than in Great Britain, and 1568 more than in France; while the rate of mortality is below that of Scotland by 362, lower than that of England by 486, lower than that of France by 1042.

The fertility attending marriages is a remarkable feature in these returns, and I collect, from the same source from which the foregoing quotation was made, the following particulars:—

Proportion of Births to 1000 Women living at the age 15-45.

Year.	Women, aged 15-45.	Births registered.	Births to 1000 Women, aged 15-45.
1861	72,403	14,681	203
1862	75,051	15,434	206

The proportional number of births in England is 149; that is to say, every thousand females living at the maternal age in England give birth in a year to 149 children, while the same number in New South Wales give birth to 204, a difference in favour of the colony of 55 children.

In Queensland the annual death rate is said to be as low as 15.7 per thousand of the inhabitants. It must be considered, however, that in all these calculations the circumstances under which they are found are exceptional. A large portion of the inhabitants of every new colony has only become resident in it at adult age, having passed the period of infancy and not arrived at that old age when causes affecting life and health are most powerful and most fatal.

I have thus endeavoured to give you in the broadest and most general outlines, the sketch of a country in which you are all interested, because it is your property and the property of your countrymen, the people of the British empire. With respect to one of these dependencies, the only condition annexed to the enjoyment of a share in the great national domain is, that you should, at your own cost, find your way to and become an inhabitant of it. In the other colonies the acquisition of land is scarcely less facile. Now if any one were told, for the first time, that he could, by crossing the British channel, acquire, either as an absolute gift, or at little more than a nominal cost, a landed estate in a country possessing almost every material advantage in the way of climate and natural resources, but where instead of meeting with foreigners, he could encounter none but those with whose habits he was familiar, and where he would still preserve the glorious privilege of being a British subject, he would surely hail such an opportunity as one greatly to be prized and resolutely seized upon by many in these over-peopled and narrow islands of Britain. The realisation of such a promise may be virtually accomplished by a short extension of the journey. A new world awaits those who are willing to encounter the task of seeking and taking possession of it. I should be very unwilling to induce any one to adopt a hasty or ill-timed view of his actual position in the old country, or to tempt him, by anything I may say, to exchange his present lot in life for a distant and untried one in the colonies. All I desire to do is simply to place before him and you facts, and the opinions which I have been enabled to form from an extended personal experience in the matters to which I have referred. I am anxious, moreover, not to be misunderstood. I have spoken of the great, I may say, unlimited capabilities of Australia, of the facilities it affords for every man acquiring—what all men covet—a piece of this solid globe as a possession for himself and as an inheritance for his children. Notwithstanding all this, eventual success must be regulated, and can only be achieved by certain classes and by those possessing certain qualifications. Reverting to the idea of how great the privilege would be considered of acquiring an estate as an absolute gift, or at a merely nominal cost, a moment's reflection would convince us that such a possession would be worthless without hands to cultivate, people to occupy, and others to consume that which the land was capable of yielding. Now, the great want of the colonies is labour; land only acquires value as people gather upon or near it. A man without capital, therefore, often does much better by selling his labour to another than by employing it on his own account and on his own property. Land is cheap in consequence of its great abundance. Labour is dear in consequence of its scarcity. The man therefore who sells his labour and his skill to another, is enabled to accumulate his savings to realise a certain capital wherewith to acquire and improve land of his own, and to hire the services of others in its improvement. The demand for labour in the colonies is constant, unceasing, and I may say ever augmenting. Every labourer, every artisan, may in the course of a very brief period become an employer of the labour of others. It is, however, labour specially adapted to the requirements of a new society. For those who can occupy themselves in agricultural and grazing pursuits the demand is practically unlimited; for those conversant with various handicrafts, such as carpenters, masons, bricklayers, blacksmiths, wheelrights, the demand is always greater than the supply. As a general rule, I would say that the Australian colonies present special attractions to three classes, the agriculturalist, the rough mechanic, and the capitalist. As a field for those who have been bred to professional callings, mercantile clerks, and small tradesmen, the inducements are questionable. The reputation of the colonies has been damaged by the fact that classes unsuited by education and previous calling have gone out to them in too great numbers. I believe that eventually a promising field is open to every man willing in some degree to mould himself to the requirements of the society in which he lives and with which he casts his lot. I need hardly tell you how many are attracted by the gold fields. I would advise no one to yield to this temptation. Gold seeking is to a certain, nay, to a considerable extent, gambling. The average earnings of such as are engaged in the pursuit are not good, not so

good as of those employed in many other branches of industry. The occupation of gold digging everywhere is laborious. None but such as are capable of doing the work of English navvies, are fitted to engage in it. When first the rush to the gold fields took place at Port Philip in 1853, thousands already comfortably settled, of all classes, forsook their ordinary employment, and created a complete *bouleversement* throughout the whole framework of colonial society. The services of mechanics and household servants could only be obtained at preposterous rates. A carpenter or mason would receive £2 or £2 10s. a day. A cabman once demanded from me £5 for driving a distance under a mile. The "boots" of an inn was said to be in the receipt of £1,200 a year for salary and gratuities, whilst nearly all the most indispensable necessaries of life, lodging and food, could only be commanded at the most exorbitant rates. The madness, the confusion, and the misery of this state of things was augmented by the daily arrival of hundreds of fresh emigrants from other parts of the world, The wretchedness and disappointment that many of these endured were unspeakable, and a state of society was temporarily exhibited such as, I believe, was never before witnessed in any part of the world in any age. Young men from the universities, lawyers, physicians, clergymen, those engaged in the lighter occupations of commerce, landed in shoals on the beach at Melbourne. There were not sufficient dwellings to afford them shelter, and some eight or ten thousand persons, many of them women and children, were at one time encamped in the neighbourhood of the city. The small stock of money and provisions with which the adventurers were furnished became exhausted, and thousands were obliged to accept of temporary employment, at 10s. a day, on the public roads to escape starvation. All this has happily passed away, and the people who now seek their way to the colonies are such as are generally suited to its requirements. To the young man who has some capital, who is endowed with some degree of enterprise, and who is capable of a certain amount of self-denial, the occupation of sheep farming has much to recommend it. The squatter has, however, many trials. He must be prepared, in the outset of his career, to work hard, to live under a bark hut, to ride not unfrequently some fifty miles in a single day, to sleep occasionally under a gum tree, with the covering of a mere blanket; to be contented with tea and damper and mutton-chops as his ordinary fare; to be so placed that he may only get hold of a newspaper once a week or once a month;—all these, and many other disagreeable privations and hardships, he must be prepared to submit to. Yet, withal, the life is not without redeeming features. The sky and the air are, for the most part, bright, genial, and exhilirating. If the squatter can keep out of his merchants' and bankers' books—if he possess a good run—he knows that a few years' exertions will give him independence, if not affluence. The occupation in which he is engaged is healthful and invigorating, and a satisfaction springs up in the consciousness of how easy it is, after all, to give up many of the conventional luxuries deemed indispensable in old and highly artificial states of society. To many of the younger sons and members of the middle and upper classes—to whom the overcrowded professions of England offer but a slender prospect of success—who may possess some small patrimony, a mere temptation to idle mediocrity, insufficient to maintain them in the social status in which they have been educated, the colonies of the South offer, I think, special attractions. A moderate capital, steadiness, patience, and common prudence, are all that are needed under such circumstances to secure success. To an intermediate class—one of agriculturists—with smaller means, but able to command the co-operative labour of families, another kind of industry has recently been opened up.

The growth of cotton is now looked forward to as likely to be a profitable investment of both labour and capital. So great is the anxiety to encourage its cultivation, in both New South Wales and Queensland, that the government of each of these colonies respectively engages to give a large bounty at the rate of 10d. a lb. on Sea Island, and half that amount on the common kinds of cotton, that may be raised for export within a given period. The first consignment that reached England a few weeks ago netted 2s. 6d. a lb., which, with the bounty of 10d. a lb., will yield to the producer a rate equal to 3s. 4d. a lb. Other inducements, in the shape of free grants of land, are also held out, with the view of stimulating the same enterprise. There can be no question that the Australian colonies are capable of producing this great staple to any extent, provided they can command the requisite amount of labour. Human intelligence, human hands, are all that are needed to develop the boundless resources —some still latent, others ready to be seized upon and turned to profitable account—in these magnificent territories. They have already created an export, the annual value of which, five years ago, was estimated at £21,297,303, whilst they import and consume articles, chiefly of British manufacture, of the estimated annual value of £25,406,882. All this has been done—this wondrous development of industry, power, and means of material happiness to a large portion of mankind—effected within a space of time so brief that the whole phenomena may have been witnessed by thousands now living. When so much has been effected in so short a period, what may we not anticipate for the future? It is difficult to see any material obstacle to the onward progress, the unlimited expansion of the Anglo-Saxon race in the Southern hemisphere. I will not dwell upon the political organisation of the colonies beyond saying that they possess, each and all of them, constitutional franchises such as would, I believe, satisfy the more advanced school of politicians in England. If there be, in these vigorous societies, some drawbacks—an absence of some few of the amenities that belong to certain phases of life in older countries—the want of these is more than compensated for by the heartiness, the rough hospitality, the mutual sympathy, that characterise the relations and the intercourse of all classes. No one is exempt from the stimulus of active, useful exertion of some sort or other, no one is shut out from the privileges, the hopes, and the rewards of honest industry.

DISCUSSION.

Mr. John Crawfurd, responding to the invitation of the Chairman, said he had listened to an eloquent and instructive paper, very lucid, and full of valuable information. Australia had many advantages, and owed a great deal to the energy of its own people, but it owed a great deal more to this country. It had peculiar advantages over most of our other colonies, and also some disadvantages. For its extent it contained more desert land, perhaps, than any of the other colonies, but it also contained an abundance of good land, and its climate was excellent. Another advantage was, that it had a very wretched aboriginal population, which had never offered any obstruction to our colonization. Let them look at the difference between it and the neighbouring country—a country, perhaps, in many respects superior to it—New Zealand. We were now engaged in another war with the people there, and he believed nothing short of the complete extermination of the native population would satisfy the necessities of colonization. He was sorry for it, but it could not be helped. He remembered having a conversation with the Governor, Sir George Grey, on this subject some years ago, and he stated to him his opinion that fifty years hence not one of the Maori race would exist, to which the reply of Sir George was, "I am sorry to be obliged to agree with you in that opinion." They had shown themselves a race superior to all other aborigines. They had met us in the open field; they had adopted our improvements, which was not the case with the savages of America or the South Seas, and their determined resist-

ance would lead to their destruction sooner probably than any other of the same class of people. There was another advantage which Australia had; it was the only colony England had formed during the last 250 years which was peculiarly adapted to the growth of wool. Wool had done a vast deal for Australia, but gold had done for it even more. He gathered from the reading of the paper that £125,000,000 of gold had been produced, and what immense good that gold had done! He remembered that some statesmen in this country endeavoured to conceal the fact of the gold discoveries in Australia altogether, and they did keep it to themselves for several years. The knowledge of the existence of gold in Australia was locked up at the Colonial Office for a considerable time. It was thought that it would be detrimental to the colony, but it proved the reverse. It had not only been useful to the colonists on the spot, but to the whole world, and, according to his view, gold had suffered no depreciation whatever, because it had been the stimulus which had produced goods equal in value to itself. He believed that, before the gold discoveries, there were only about 400,000 inhabitants in Australia, but these had been multiplied threefold, chiefly, he thought, through the influence of this very gold. He would now say a few words on the subject of cotton, which was almost the only point on which he ventured to differ from Sir Charles Nicholson. He (Mr. Crawfurd) was of opinion that Australia could never enter into competition in the growth of cotton with the valley of the Mississippi and other parts of America, and would never be the great source of the supply of that material to this country. Sir Charles Nicholson had stated that the cotton sent home from Australia was worth 2s. and 2s. 6d. per pound. That was at present prices, 200 per cent. higher than the ordinary rate. When they were obliged to sell it at 6d. or 8d. per lb., he ventured to say Australia would not send a pound of cotton to this country.

Sir CHARLES NICHOLSON said the price he had mentioned was for Sea Island cotton.

Mr. CRAWFURD continued.—Sea Island cotton, as they all knew, was a very small affair in proportion to the great consumption of this country; it was only on the sea coast that this quality could be produced. The moment an attempt was made to grow it ten miles in the interior it ceased to be Sea Island, and from being worth 1s. 6d. would perhaps not be worth more than 6d,—the normal price of cotton in this country. Then again as to sugar, he did not believe that that would be successful; and with regard to a trade both in sugar and cotton, it should be remembered that Australia was 15,000 miles distant from this country—five times as far as the valley of the Mississippi: besides which, it had not the same internal communication, nor the same fertility of land. Australia was too distant, and it had not the necessary labour. There was another point on which, if it were introduced into the discussion, he would like to say a few words—viz., the connection of this country with Australia—a question on which Sir Charles Nicholson and himself differed. It was an important matter how long this connection was to last. He would, however, say nothing upon this point at present.

Mr. T. MACKAY, having been called upon by the Chairman, said he most heartily joined in the encomium which Mr. Crawfurd had passed upon this admirable paper. His own associations with the colony were almost entirely of a mercantile character. He was unacquainted with its agricultural, pastoral, and mineral resources. He had the opportunity of visiting Australia a few years ago, and he never felt so proud of being an Englishman as on the day on which he landed on the shores of Melbourne, to find that magnificent city raised in the course of seventy years, and furnishing all that the most luxurious taste could wish. With regard to the mineral resources of Australia, more especially of Victoria, with which he was best acquainted, great disappointment, he believed, had been experienced, owing to the uncertainty of labour, and the unsettled state of the mining population, owing to the influence of the gold discoveries. With regard to coal a great change was now taking place, and he looked forward to the coal field of New South Wales as likely to be one of the most valuable of the resources of the colony, particularly as supplying fuel to the steamers of the Eastern Archipelago, which were now so rapidly increasing. It must be a great consolation, after the paper lately read by Sir Wm. Armstrong at Newcastle, to find out that when the fuel of Old England was exhausted, we should have an abundant supply remaining in our own colonies.

Mr. S. SIDNEY congratulated the Society upon the opening of the present session with a paper by a gentleman so well qualified to address them. All present might not be aware that Sir Charles Nicholson had long been resident in Australia, and that he had twice occupied the position of Speaker of the Colonial Assembly, first in the Representative Assembly of New South Wales, and subsequently he was appointed by her Majesty's Government to inaugurate the establishment of representative institutions in Queensland, where he also presided over the Assembly. That circumstance gave additional weight to a most excellent paper. He confessed, interested as he had been by the paper generally, there were some points on which he could not help concurring with Mr. Crawfurd. There could not be a question that it was to convicts, to wool, and to gold that Australia owed its great prosperity. The convicts took off the first rough edge of colonisation, and with respect to wool nothing more need be said. As to gold, he remembered being in this room when the first paper was read upon the gold discoveries in Australia, and at that time every one who had any thought of emigrating made up his mind to go to this colony. He also remembered stating, on that occasion, that intending emigrants to the gold regions would be able to see a specimen of the work they would have to engage in by inspecting the operations then going on in the laying down of gas-pipes in the Strand, and from that they would see what they would have to do in Australia; but he could not say that his remarks produced much effect, for the gambling spirit was largely prevalent among all classes of the community. That people should have gone out to Australia had been greatly to our advantage, for he remembered the time when it was almost necessary to force a man to emigrate, whereas the attraction of the gold discoveries had quite altered this state of things. No doubt what Australia wanted most was labour; but he did not think people required much incitement to emigration in the present day. He remembered the time when large crowds of working people flocked to hear a lecture upon emigration; but at the present time there was scarcely a village in England in which there were not some inhabitants who had relatives doing well in Australia, and who, through the post-office, communicated their prosperous condition to their friends at home. He would not sit down without alluding for a moment to a movement in emigration which was due to a lady, who had not been so successful in her plans as they could have wished, Mrs. Chisholm. That lady suggested two things which promoted emigration more than anything else—one was the land system, holding out the temptation of an allotment of land when the emigrant arrived; the other the system of assisted emigration, by means of which people paying a certain sum were able to send out their relatives by receiving a contribution from Government—a plan which he believed had operated very beneficially. Mr. Sidney also referred to the efforts made by Miss Rye in promoting female emigration to our colonies, and expressed his opinion that no organisation for sending out large bodies of females would be successful. The only satisfactory plan, he believed, was that of family colonization. If the colonies had their own way no doubt they would wish to have only the young and vigorous portions of the community sent out, but if they had the young they must be content to receive the middle-aged and the old relations of those

who went out. Emigration was no doubt an excellent thing for those who had large capital for the employment of labour at high rates; and a good thing also for those who had labour to dispose of at high wages; but with regard to the middle class, who had only a small capital to invest, emigration should be undertaken with care and consideration, and not without having some friend who could give them good advice upon their landing. Having been himself engaged for many years in promoting emigration, he confessed that the results with regard to persons with small means had been rather of an unsatisfactory character. There was one point worthy of notice to which Sir Charles Nicholson had referred with great personal modesty, but it was one in which this country took great pride. He referred to the University established in Australia, in the foundation of which he believed Sir Charles Nicholson was mainly instrumental. It was most gratifying to find that in this distant locality, where great fortunes had been made, and where general commercial prosperity prevailed, literature, science, and the arts had not been neglected.

Mr. Jordan (Government Emigration Agent for Queensland), having been called upon by the Chairman, after speaking of the great merits of the paper, said he fully concurred in the views of Sir Charles Nicholson on the subject of the growth of cotton; indeed, he believed he went further in his confidence as to the capabilities of Australia, especially Queensland, for the production of this material, not only the Sea Island but also the more ordinary qualities. Mr. Cheetham, the chairman of the Manchester Cotton Supply Association, had told him that if the Sea Island cotton could be produced at a somewhat less price—the price having been 2s. per lb. before the American war—if it could be produced at 1s. 6d. per lb., the consumption of that particular description would be doubled in twelve months. Even supposing for a moment they did not grow the Orleans cotton, and confined themselves to the Sea Island, that quality could be produced with a large profit at 1s. 6d. per lb., and the probability was that a large quantity of that cotton would be sent to the British market. Mr. Bazley had stated that, without exception, the Sea Island cotton from Queensland was the finest that had ever been received into Great Britain—that however much they could produce of that quality, there would always be a market for it at an average of 1s. 4d. to 1s. 6d. per lb. Mr. Crawfurd had suggested that if they left the sea coast they could no longer produce Sea Island cotton. That was true; but there was no reason for leaving the sea coast, as they had 1,300 miles of it, which, along its whole extent, was perforated by beautiful bays, the outlets of fine navigable rivers—short, but wide, and adapted for the purposes of commerce. The whole extent of land required to produce the 800 million lbs. of cotton sent to this country from the Southern States of America was only two million acres, and if the number of people who emigrated in one year could be sent exclusively to Queensland, and induced to engage in cotton growing, they would be sufficient to cultivate the two million acres which would supply all the cotton that was consumed by the looms in Lancashire. The growing of cotton in Queensland had not been taken up by the great manufacturers and statesmen of England. It had a territory twelve times the size of England and Wales put together, and yet it had only 52,000 inhabitants; but he was happy to say that, with the assistance of Mr. Mackay, who had just addressed them, about 10,000 persons were now annually sent to that one colony alone, and the Queensland Government had created such facilities for the development of the great cotton capabilities of that colony, that he was surprised that the 10,000 was not 100,000, and that, instead of six or seven cotton companies (who were growing cotton successfully, and realising such profits, that even at ordinary prices, supposing the American war were to terminate to-morrow, they would still be able to cultivate profitably), there were not sixty or seventy such companies. Let them look at the inducements held out for this enterprise The government of Queensland said, "You shall have the land for nothing. We will give you 18 acres for every man, woman, and child you bring out, and we will give you a bonus of 8d. per lb. upon all the cotton you grow as well." That cotton was now selling at 4s. per lb. They did not, however, base their calculations upon such a price as that, but upon ordinary commercial prices. If emigration went on, as it no doubt would, they would get labour at reasonable rates, and he believed, in ten or twenty years at most, they might with the greatest ease send from Queensland alone all the raw material of cotton that was required in this country. The distance it had to be brought was no difficulty whatever. Mr. Mackay had stated that he could bring cotton from Queensland at the same price as from New Orleans. There were so many large ships going out to this colony with merchandise and emigrants, that they had to wait for return freights, and they sent the ships to India and China to procure them; consequently cotton could be brought from Queensland at the same rates for freight as it could from New Orleans.

Mr. Edward Hamilton, being called upon by the Chairman, said he believed all the facts stated in the remarkable paper read by Sir Charles Nicholson would be admitted and were not open to controversy, and the discussion had arisen for the most part upon some observations which had fallen from his friend Mr. Crawfurd, calling in question the possibility of the profitable growth of cotton in any part of Australia otherwise than under the present exceptional state of things. He thought the answer given to Mr. Crawfurd's criticism by Mr. Jordan would be accepted as complete and satisfactory, for he showed not only that there was an almost unlimited district for the growth of Sea Island cotton, but that even if the war in America were over, the mere fact of the greater distance the cotton had to be brought would not prevent it from coming into successful competition with that grown in the Southern States of America. He would refer to the observations in the way of caution to emigrants which fell from Mr. Sidney. He thought the advice thus given, unless it were to a certain extent qualified, was calculated to do mischief. No doubt young men, who in this country came under the category of "Ne'er-do-weels" were not likely to succeed much better in Australia, and he found in his own experience (and he was constantly being referred to by one friend or another who wished to send some young relative to the colony) that the persons they wished to send out were those whom their friends could not manage in this country. That was treating the colony unfairly; if they wanted a colony to do well they should send out the best members of society and not the worst. The temptations, no doubt, were great, and often produced the most serious evils. He had seen people reared as gentlemen in this country employed in breaking stones and cutting wood; but they were persons who probably would not have done well in any part of the world, and the disorders of the mind and character could not be cured by the mere transplanting into another country. He thought that explanation was necessary to guard against the effect of the observations of Mr. Sidney, who seemed to ground his remarks upon some amount of experience. Moreover, in choosing a colony for emigration, it was important to ascertain its special characteristics. He regarded New Zealand as being suited for the middle and yeoman class, and the other Australian colonies for the upper and lower classes; and he thought that, without exception, there was no finer field for emigrants of all classes than was to be found in these colonies. With reference to the occupations in these colonies, they were of the most varied character. Those who had the thews and sinews of navvies might go to the gold fields; those inclined to follow a more sedentary life would engage in pastoral pursuits; and he knew from his own experience that a man employed as a shepherd could not only live

in comfort, but was also able to lay by a considerable sum of money, and at the end of a few years become possessor of a farm and flocks of sheep. The able paper of Sir Charles Nicholson, together with the observations of Mr. Jordan, had so fully exhausted the subject, that he felt he could not profitably add any further remarks.

Mr. P. L. SIMMONDS, while coinciding in the opinions advanced by the previous speakers as to the value of the paper which had been read, thought that there were one or two broad facts which might be put forward more prominently in the interest of the colonies. Sir Charles Nicholson had had to deal generally and superficially with the subject, in order to bring it within the usual limit of time. Hence, in treating of six important colonies (even setting aside New Zealand), it was impossible to do more than speak in the most general terms. Observing several Australian colonists present, he had hesitated to rise, under the hope that they would have been disposed to speak on the subject with a larger amount of practical knowledge than he necessarily possessed. Sir Charles had given them some of the salient facts calculated to show the remarkable strides which the Australian colonies had made, but his figures were rather understated, and scarcely did fair justice to Australia at the present time. The total amount of the estimated trade of those colonies was given by him at about 46¾ millions for five years ago, but the trade now was certainly five or six millions above this, looking at the great advance in wool, and the higher prices obtained. In going somewhat closely into the calculations a year or two ago, he found that for the year 1860 the total value of the imports was, in round numbers, £28,000,000, and of the exports £22,000,000, making a total trade of 50 millions. In the last five years even the quantity of wool we had received direct from Australia had risen from 50 million pounds to nearly 71½ million pounds. In 1861, the value of the direct imports into the United Kingdom from Australia was £7,000,000, besides gold to nearly the same amount; and last year the merchandise and British manufactures we sent there was to the value of £12,000,000. Now that the great island continent had been traversed from east to west and from north to south, and that the nature of the interior was better understood, its general progress was becoming more rapid. The grazing ground was found to be most extensive. There was no lack of water. The new system was better understood, and the domestic animals were increasing so rapidly, that already they were reaching fast towards the numbers possessed by the old country. Of sheep, they now owned about twenty-five millions; of cattle, four and a half millions; and of horses, five millions; while recently the camel, the alpaca, the Angora goat, and other domestic animals had been introduced, and many of the song birds and game animals of England. To speak much in detail of the products of Australia would be unnecessary, with the recollection fresh in the minds of those present of the magnificent display made by the Australian colonies at the International Exhibition —a display so varied that it not only surprised foreigners, and the Secretary of State for the Colonies, but might well be pointed to with pride by the people of this country. The rich mineral products, the timber and wood trophies, were unsurpassed. And last, but not least, Australia demonstrated its wonderful agricultural and horticultural capabilities in grain, which carried off the palm for weight and beauty against all competitors; and in models of fruits and vegetables equal to any produced in Europe. Australia, with the steady agricultural progress making in South Australia, Victoria, and Tasmania, bid fair soon to be self-supporting, instead of having, as formerly, to import flour and wheat from Chili or America. The wheat and maize of Australia commanded general admiration among agriculturists. Sugar had been spoken of as a future food staple of Australia, and there was no reason why Queensland, which was in about the same latitude as Natal, should not rival it in producing sugar; it was only a few years ago that Natal entered into the production, and now about 5,000 tons were made there annually. With the extension of coal production in Australia, additional progress would be made in external and internal communication and manufactures. Two million tons had already been produced in the New South Wales collieries in the past ten years, and the collieries there were capable of producing and shipping 20,000 tons weekly. Mr. Jordan had told them what was doing in emigration in Queensland, and he believed assisted emigration was also being promoted now to Victoria and to New Zealand. In the last quarter of a century, 750,000 souls had left our shores for Australia. About ten years ago the great tide of emigration used to set across the Atlantic, and about 25,000 persons left British ports annually for America; now not one-fifth of that number went, and it was satisfactory to find that at least half the emigrants from the United Kingdom now go to Australia.

The CHAIRMAN, in closing the discussion, said, with reference to the remark of the last speaker, that Sir Chas. Nicholson had understated the advance made by this colony, it could not be regarded as a fault in the paper, but it might have been a grave objection if this had been overstated. Some very important facts had been laid before them, but to his mind, there was none more interesting than the allusion to the first produce of 240 lbs. of wool from the little flock of Sir Edward Macarthur, who was, he was happy to say, now present, and had lived to see the total exports of that material from the colony amount to no less than sixty million lbs. per annum. It was a most gratifying circumstance, looking at the commercial aspects of the case, to find that the imports of British manufactures into this colony amounted to no less than £20 per head of the population, whilst those into the American States amounted to only 19s. per head. This exhibited an amount of trade with the colony which was highly beneficial to our manufactures. Another gratifying fact was the great abundance of good timber, and also that sugar-growing, to which Mr. Crawfurd took exception, was being carried on to a considerable extent. It was true that both the timber and the sugar would have to be brought a distance of 15,000 miles, but with regard to the latter commodity, a large amount of it was brought to this country from Bengal, a distance by the Cape of 12,000 miles. He apprehended that the vast extent of sea coast stated by Mr. Jordan to be available for cotton culture, would greatly modify the views which Mr. Crawfurd entertained as to the practicability of the profitable growth of cotton in these colonies; whilst the bounty of 8d. per lb., offered by the local government of Queensland, would in itself be a great incentive to the increased production of that article. The realisation of man's natural desire to possess land was not difficult in this colony; a man with habits of industry was almost sure to work himself into independence in a short space of time. Allusion had very properly been made to the intimate connection of Sir Charles Nicholson with the foundation of the University of Sydney, and to the modesty of that gentleman in speaking of that interesting circumstance. A few days since he was accidentally reading an account of the proceedings which took place at the opening of that University, as given in the "Reminiscences of thirty years residence in New South Wales," by Judge Therry, and he was sure he should be pardoned for quoting a very short extract of what fell from Sir Charles Nicholson on that interesting occasion:—"Whatever tends (said Sir Charles) to enlarge the domain of thought, to make us acquainted with the things that have been before us, and those that are beyond us, seems best to impress us more deeply with sentiments of humility and reverence for the Great Author of all things." He would further quote a few emphatic words of encouragement:—"I would direct the gaze of the student, be he ever so poor and friendless, that here he may acquire a distinction, the reward

of merit only. Knowledge to him will here unfold her ample stores—all the spoils of time—all the treasures of thought, and all the bright domain of a glorious future may here become his." He would add that Sir Charles Nicholson showed the most devoted zeal, not only by giving his time and ability to the service of the university, but by liberal donations—upwards of £3,000 in value—of classical, mediæval, and Egyptian antiquities, besides other gifts. His duty now only remained to propose, what he was sure would be readily agreed to by the meeting—that their best thanks be presented to the author of the admirable paper which they had heard this evening.

The vote of thanks having been passed,

Sir CHARLES NICHOLSON briefly acknowledged the compliment paid to him. He wished to add one word in reference to what had fallen from his excellent friend Mr. Crawfurd, who desired to know his (Sir Charles's) opinion as to the perpetuity of the relations which existed between this colony and the mother country. He could not but express an earnest hope that the period when that connection, which now so happily subsisted, should be brought to a close, might be remote. He also ventured to say this, that when the separation did take place, the fault of that separation would not be with the colony, but with the mother country.

The Paper was illustrated by a collection of products from the colonies referred to, kindly lent by the Victoria Emigration Assistance Society.

The Secretary announced that on Wednesday evening next, the 2nd December, a paper by Mr. F. H. Holmes, "On Magneto-Electricity, and its Application to Lighthouse Purposes," would be read.

Proceedings of Institutions.

SHREWSBURY DISCUSSION SOCIETY.—The following is the list of subjects to be discussed during the present Session:—"Would the Open Church Movement be productive of evils quite as great as those it is intended to obviate?" "Has the Literature of the present day, known by the term '*sensational*,' a tendency to elevate the minds of the people?" "Was Earl Russell justified in causing the seizure of Messrs. Laird's Steam Rams?" "Was the policy of William Pitt beneficial to England?" "Is the Pulpit or the Press more potent in the present day?" "Has the influence of Puritanism been beneficial?" "Is it probable that the world will ever again possess a Dramatic Writer as great as Shakspeare?" "Would a merely Secular Education of the masses prove beneficial or injurious to our social interests?" "Has the Bicentenary Celebration been beneficial in its effects?" "Is Poverty a permanent element in society, or is it a phase of social condition which an increased civilization will eventually remove?" "Is the Volunteer Corps likely to prove a permanent and efficient means of defence against Invasion?" "Is the character of Oliver Cromwell worthy of our admiration?" "Are there good grounds for applying the term 'dark' to the Middle Ages?" "Which is to be preferred—a Town or a Country Life?" "Is a revision of the Book of Common Prayer desirable?" "Was the Conversion of the Emperor Constantine beneficial to Christianity?" "Was Wellington or Napoleon the greater man?" "Has not the Faculty of Humour been of essential service to Civilization?" "Does Civilization necessarily lead to Demoralization?" "Ought Slavery to be gradually or instantly abolished?" The regulations of the Society provide that each member shall select his own subject for debate, and shall announce the view he intends to advocate on the Wednesday night preceding his discussion. The leader of a debate is allowed twenty minutes for his opening speech, and fifteen minutes for reply; or, in case of adjournment, twenty minutes for reply. Each succeeding speaker is allowed fifteen minutes. If a proposition be made for adjourning a debate, and be carried, the proposer of the adjournment (who must differ in opinion on the question with the opener of a debate) leads on the occasion.

CHARGES AT HOTELS.

The numerous new hotels now erecting everywhere afford a favourable opportunity for many reforms. Be the charges high or low, the policy of which the public will determine for itself, much comfort to travellers would be insured if the plan of the Hotel du Louvre, at Paris, were published, and the tariff affixed in every apartment. This hotel furnishes to everyone a nicely printed bill, as follows, which will interest all who have to do with travelling. There are five kinds of aspects to the rooms at the Louvre, which exceed seven hundred in number.

TARIF DES PRIX DES APPARTEMENTS.

DESIGNATION.		Place du Palais Royal.		Rue de Rivoli et de Marengo.		Rue St. Honore.		Cour d'Honneur.		Cours de l'Hotel.	
		fr.	c.	fr.	c.	fr.	c.	fr.	c.	fr.	c.
Salons	1er etage ...	20	0	20	0	15	0	12	0	8	0
	2e id. ...	15	0	15	0	12	0	...		...	
	3e id. ...	10	0	10	0	8	0	...		...	
	4e id. ...	7	50	7	50	7	50	...		..	
Salons-Divans	1er etage ...	...		...		..		...		...	
	2e id. ...	...		...		...		...		..	
	3e id. ...	6	0	6	0	5	0	...		...	
	4e id. ...	5	0	5	0	4	0	...		...	
Chambres à un Lit	1er etage ...	10	0	10	0	7	0	6	0	6	0
	2e id. ...	8	0	7	0	6	0	5	0	4	50
	3e id. ...	6	0	5	50	4	50	4	0	3	50
	4e id. ...	4	50	4	50	3	50	3	0	3	0
	5e id. ...	3	0	3	0	...		...		...	
Chambres à Grand Lit	1er etage ...	...		12	0	10	0	...		8	0
	2e id. ..	...		10	0	8	0	7	50	6	0
	3e id. ...	...		8	0	7	0	5	0	5	0
	4e id. ...	6	0	6	0	5	0	4	50	4	50
Chambres à deux Lits	1er etage ...	20	0	15	0	14	0	12	0	10	0
	2e id. ...	14	0	14	0	11	0	10	0	10	0
	3e id. ...	11	0	11	0	9	0	7	0	6	0
	4e id. ...	8	0	8	0	7	0	6	0	6	0
Salles à Manger ...	1er etage ...	...		...		...		...		10	0
Chambres de Domestiques	5e etage ...	...		1	50	...		...		...	

Service ...... { 1er, 2e et 3e etages, 1 fr. 50 c. par personne et par jour
4e et 5e etages, 1 fr. par personne et par jour.

TARIF DES CONSOMMATIONS.

DEJEUNERS.

	fr.	c.
Café, chocolat ou thé, avec pain et beurre, au restaurant	1	50
id. id. dans les appartements	2	0
Thé complet, avec bouilloire, au restaurant	2	0
id. id. dans les appartements	2	50
Deux œufs à la coque	0	50
Une bouilloire	0	50
Déjeuner à la fourchette, à la carte	...	

DINERS.

Diner à table d'hote..	7	0
Diner à part, au restaurant, à la carte........................	...	
id. dans les appartements, à la carte	...	
Nourriture d'un domestique, par jour	5	0

DIVERS.

Un panier de bois	2	50
Une lampe	2	0
Une bougie	1	0
Une veilleuse	0	60
Un bain avec linge	2	0
Un bain de siege	0	75
Un bain de pieds	0	50

Fine Arts.

THE LATE PROFESSOR COCKERELL'S drawings and sketches are now being exhibited at the rooms of the Institute of British Architects in Conduit-street.

CHEMICAL ENGRAVINGS.—Mr. Fox Talbot, one of the earliest experimentalists in photography, has just added one to the list of chemical photographic engravings. It represents a scene in Java—a ravine and rivulet fringed with banana trees. It is said that at least 5,000 copies can be taken before the plate deteriorates. There have been so many attempts and so many failures that any genuine, undoubted success in this direction would be welcome.

THE BRITISH INSTITUTION.—On the 18th of November a private view took place of the copies made by students in art, from the pictures left by the proprietors of them for that purpose, after the usual exhibition of works by ancient and deceased masters had been closed. The subjects left for study have been decidedly in favour of portrait painters. Landscape painting would seem to have excited little attention among the students, and even the selection of portraiture appears to have been greatly influenced by historic value. One portrait of Bourgomaster Six, by Rembrandt, has been copied no less than twenty times.

THE SALE OF PHOTOGRAPHS of Raffaelle's Cartoons and other works, formerly conducted by the Science and Art Department, has been handed over to the usual trade publishers. Messrs. Chapman and Hall are the chief agents. The effect of this step has been very nearly to double the price. The Department in future will only issue to the Schools of Art in connexion with it.

SIX OF THE MASTERS OF ART SCHOOLS have been directed to proceed to Paris to report each separately on the works of the Schools of Art in France, now brought together for the first time, and exhibited in the *Palais de l'Industrie.*

THE NATIONAL GALLERY.—Twenty-nine pictures have just been added to this collection, which quietly increases in value and importance under the judicious charge of Sir Charles Eastlake, P.R.A., and now contains some of the finest examples of the greatest masters, the whole collection being marked by the selectness of the works it comprises, both in regard to their intrinsic art merits and their excellent state of preservation—qualities in which Englishmen should learn that their Gallery is unrivalled. Of the pictures which have now been hung no less than twenty-two were "presented by Her Majesty in fulfilment of the wishes of the Prince Consort," and were the pick of the Wallerstein collection, privately purchased by the Prince in 1850, Her Majesty having, with a gracious consideration, permitted this selection to be made. These additions aggravate the previous want of space. The pictures have been partially re-hung and new screens added. Two screens now occupy the new room built for the Italian pictures, another is placed in one of the smaller rooms, and two in the room filled with Turner's works. By such an arrangement, which is unavoidable, the general effect of the galleries is sadly spoiled, and the visitors incommoded—nor are the screens properly adapted for the display of the pictures. The light suited to the pictures on the walls falls perpendicularly upon those on the screens, and the glitter is doubly aggravated by their proximity to each other and to the wall pictures, both of which are reflected in the glass by which the works are now largely protected. The Turner room is understood to be altogether temporary and exceptional, but it is no less painful to see our great painter's works heaped upon the walls, mounted even above the cornice, and filling the coved ceiling.

THE HAMPTON-COURT GALLERIES.—A visit to these galleries shows that the Royal pictures continue to increase in interest under the intelligent care of her Majesty's Surveyor-General of Pictures. Many fine works, formerly hung in bad situations, have been brought into more prominent places. The works of the Venetian school are being gradually grouped together; and several which, from being obscured by bad repairs and repeated varnishes, had been overlooked, have been judiciously restored, and prove fine examples—among others, a beautiful small picture by Old Palma (formerly hung in the Queen's Chapel, and called erroneously Titian), and a work by Savoldo, of Breschia, a somewhat rare master, which had heretofore been attributed to Pordenone. The nine compartments of Mantegna's "Triumph of Julius Cæsar," a work in tempera, and in a sad state of decay, have been carefully glazed, to prevent, as far as possible, further injury. The room known as the public dining-room has been repaired, the catafalque used at the Duke of Wellington's funeral removed, and the room entirely hung with portraits of the British School—among others, the two fine pictures, by Gainsborough, of Colonel St. Leger and Fisher, the composer. This gradual classification of the pictures, which must be a work of much judgment and difficulty, is greatly to the credit of the Surveyor, and will add largely to the attractions of the collection, and the pleasure the public feel in visiting it.

PARIS.—The *Ecole des Beaux Arts* has been re-organised. It is now styled the Imperial School of the Fine Arts, and will commence a new session on the 1st January next under M. Robert Fleury, who has been appointed the Director for five years, with a salary of 8,000 francs. For the general government a council has been nominated, presided over by the Duc de Morny, and comprising three senators, two painters, two sculptors, and two architects, all men of eminence, with, as *homme de lettres*, Théophile Gautier, who commenced his career as a painter.

The French Academy of the Beaux Arts at its sitting on Saturday, elected Mr. Donaldson to be a foreign corresponding member in the room of the late Mr. Cockerell.

Manufactures.

SUGAR BOILING IN CLAY PANS.—SIR,—Those of your readers who have witnessed the boiling of sugar in iron or copper must have come to the idea that these metals must affect the sugar produced to a considerable extent. I see a great attempt in coating iron cooking utensils with enamel, principally, I believe, made of tin, but I grieve to see few attempts to have a pan of fire-clay. There might be a great many more experiments tried with fire-clay and admixtures of silica. Fire-clay is found, strange to say, in no districts devoid of coal, and I think I may add iron, for I am not aware that it is found where lignite simply exists. I am in hopes the insertion of this may arouse some to try what can be done in this important matter.—I am, &c., COLIN MCKENZIE DICK, Formerly of Trinidad, Sugar Planter.

AZULENE.—This is a new organic body, discovered by Mr. Septimus Piesse, existing in and forming a proximate constituent of several ottos or essential oils. It is remarkable on account of its beautiful blue colour. There are but few liquids which give a coloured vapour when boiled, but azulene is one of them; like itself, its vapour is blue. Azulene is soluble in fatty and volatile oils, in alcohol, and nearly every other liquid (with the exception of water), to all of which it imparts its colour. It is a very permanent body, and bears a temperature of 700 or 800 deg. Fahr. in a sealed tube without alteration. None but the strongest chemicals, aided by heat, will break up its constitution. Two blue oils, *Matricaria chamomilla*, and *Achillea millefolia*, which owe their colour to the presence of azulene, have been examined by Sir D. Brewster. He says, "They differ from all the various bodies which I have yet examined. Between the two lines A and B of Fraunhofer's map of the spectrum, there are two groups of lines, and the two oils absorb the light in these portions more power

fully than in the portions adjacent to them. No other fluid or solid on which I have made experiments acts in a similar manner; but, what is very remarkable, the earth's atmosphere exercises a similar action when the sun's light passes through its greatest thickness at sunrise and sunset." In a paper by Mr. Piesse, read before the Chemical Society, describing azulene, the author stated that blue otto of chamomile yields one per cent., otto of wormwood three per cent., and otto of patchouly six per cent. of the new body. The patchouly plant is already commercially cultivated at Penang, and any quantity can be grown in Ceylon. Patchouly is said to enter into the composition of Indian or Chinese ink. Mr. Piesse thinks that, on account of the general presence of azulene in volatile oils (to which, in a measure, it gives their colour), it plays some special part in connection with these odoriferous bodies, and he hopes soon to elicit some more facts relative to it. Residents in the colonies, who are familiar with coloured volatile oils not known in England, will assist Mr. Piesse in his investigation if they will send him small samples, to the care of the Secretary of the Society of Arts.

Vanadium.—This rare metal has been found to exist in pig iron. Vanadium has been found hitherto in very few substances, chiefly in the scarce mineral known as vanadiate of lead; it has also been detected in a kind of iron ochre, and in the French mineral bauxite, which is now so largely employed in the manufacture of aluminium. Vanadium has already received an important application in the manufacture of writing ink. The very finest black ink, perfectly indelible by chemical re-agents, or by exposure to the combined influences of air and moisture, is made by adding a minute portion of vanadic acid to water containing some tincture of nutgalls. This ink is already in use for some special purposes, consequently a new source of vanadium is a matter of great practical importance.

Fencing Machinery.—A case of interest to millowners was recently decided at Little Bolton. The proprietors of Prospect Mill, Harwood, were summoned for neglecting to fence their machinery, in consequence of which a young woman was killed. It was shown that the fencing had only been taken away for the purpose of alteration, but the magistrates nevertheless inflicted a penalty. They held that the people should not have been allowed to work in that part of the mill.

Commerce.

A new kind of Rudder has been patented by Mr Lumley. It is made in two pieces, which are joined in the same manner as the rudder itself is fixed to the vessel; then there are two chains fitted on the outer edges of the tail-piece, but on opposite sides, which chains cross each other through diagonal slots in the body of the rudder, and are then duly affixed to the sternpost. In working the rudder in the usual way the tail part works at angles to the body, precisely as the body makes angles to the vessel; hence a recessed surface is formed and (according to the inventor) double the steering power is obtained—an angle of ten degrees with the new rudder being equal to twenty with the old one. This new rudder has been applied to several large vessels in the Royal Navy—the *Locust*, the *Bulfinch* gunboat, and the *Columbine* steam sloop, a vessel of 600 tons and 150 horse-power, which has just returned from a cruise off the Scottish coast. Twelve other ships have also adopted it. It is asserted that for inland river navigation the power which this rudder places in the hands of the steersman will allow of a considerable addition in length being made to ships of commerce. The rudder is said to be applicable to every vessel, from the rowing boat to the first-class man-of-war.

The Petroleum Trade.—From the 1st of January until the close of October, 1862, there were 5,195,481 gallons shipped from New York alone. For the same period this year New York has exported 15,503,166 gallons; Philadelphia, 4,268,244 gallons; Boston, 1,604,846 gallons; Baltimore, 806,361 gallons. In round numbers the total value of the exports from the ports above named from January 1st until the close of October will not fall short of 10,000,000 dollars, so that hereafter petroleum is fairly entitled to rank among the staples of America. Rock oil is indigenous to very many countries, including the British West Indies, which Philadelphia has, nevertheless, supplied with 23,682 gallons thus far this year. But it would seem that the Pennsylvania and Canada wells have at present a monopoly of the markets of the world, whatever be the cause. In the course of a few years other nations may rival America in the production of pretroleum. Already it is stated that a district has been discovered in Russia of similar formation to that of the oil-producing regions of Pennsylvania and other parts of America; and also that mineral oil has been found at Gaspé, a thriving part of Canada East, where its existence was indicated fully 20 years ago in the geological reports of that section.

French Trade.—Although there is generally a falling off at this season of the year in the manufacture of machinery in the great ironworks about Paris, orders are being daily received for locomotives for the Italian and Spanish railways. The construction of iron bridges likewise employs a great number of hands. Orders for handsome carriages are every day increasing. Those engaged in the building trade were never more prosperous. The construction of the docks of St. Ouen occupies numerous workshops; while stonecutters are preparing the granite which is to serve for the foundation, the iron rafters for the storehouses are being forged in the neighbourhood. A large order has been received from Milan for the apparatus required to light that city with gas. The manufacturers of stained paper cannot find sufficient hands to execute the orders on their books. The decorators and gilders of porcelain are equally well employed, and the men engaged in the manufacture of pianos frequently work extra hours. Skilled cabinet makers, capable of carving articles of furniture, are in a similar position. Woollen spinners are fully employed, and cotton spinners are beginning to find employment. Manufacturers of perfumery find it difficult to supply their customers. The impulse given to French commerce and industry by the abolition of the system of protection is becoming every day more manifest to the manufacturers of Paris. The exports from the 1st of January to the 1st of October equal in amount the entire exports for the year 1862. England and Belgium have particularly contributed to this development of French industry. England has taken lace, plain and figured silks, merinos, articles of ladies' dress, mercery, ribands, linen and cotton cloths, bleached and unbleached; gilt and plated bronzes, jewelry, clocks and watches, porcelain, wrought steel, stained paper, engraved music, a quantity of chemical ingredients, such as potash, chloride of lime, nitrate of soda, and sulphate of copper; refined sugar, dressed skins, and a variety of basket work. It is expected that the exports to England this year will amount to 100,000,000 francs more than those of the last.

Imports of Coal into London.—The total imports of seaborne coal into the Thames this year, up to the end of October, were 2,692,208 tons, in 7,964 ships, being an increase of 77,551 tons as compared with the corresponding period last year. By railway, the imports this year have been 1,430,013 tons, an increase over last year of 243,562 tons. By canals, 8,101 tons, a decrease of 2,098 tons. The total imports in the ten months, therefore, were 4,131,322 tons, an increase of 163,913 tons over last year. The general foreign shipments of coal from all the ports thus far this year show an increase of 193,809 tons.

Trade with Western Africa.—In 1827, the value of British and Foreign goods exported from the United Kingdom to the West Coast of Africa, was £155,759; in 1840,

£410,798; in 1850, £890,216; in 1860, £1,145,431. The total value of imports from Africa into the United Kingdom, for the six years 1856 to 1861, inclusive, amounted to £9,804,356. In 1818, the import of palm oil into England from Africa was 1,465 tons; in 1823, 3,328 tons; in 1831, 8,164 tons; in 1841, 19,853 tons; and in 1860, 40,216 tons. The increase in one article, palm oil, though large, is trifling when compared with the resources of Western Africa, while many articles, equally or more important and abundant, have been totally neglected, or have only very recently received attention.

Publications Issued.

The Current Gold and Silver Coins of all Countries, their weight and fineness, and their intrinsic value in English money, with *fac-similes* of the coins, by Leopold C. Martin and Charles Trübner. (*Trübner and Co.*) This work contains representations of upwards of a thousand coins, the weight and fineness of which are given in French grammes amd millièmes, as well as in English Troy grains and English technical terms. The British gold and silver coins represented amount to 108; these include also those issued for the British colonies. Our gold coins represented amount to 31, and pieces of silver to 77. Many, however, of the former, and some of the latter, have never been practically circulated; thus, for example, the large five and two-guinea pieces are practically obsolete.

Wine, the Vine, and the Cellar, by Thomas G. Shaw, with 26 wood engravings, 8vo., 16s.—(*Longman.*)

Meteorographica, or methods of mapping the weather, by Francis Galton, F.R.S. (*Macmillan and Co.*)—The author explains a new method proposed by him for registering the chief daily meteorological phenomena, in such a manner as to indicate at once to the eye the comparative meteorology of a considerable extent of country. He exemplifies his process by a series of small charts, showing the greater part of Central Europe and the British Isles, with the meteorological phenomena presented in the morning, afternoon, and evening, at various stations scattered over the surface, during the month of December, 1861. Each station of observation is indicated by a small oblong space, printed by means of type, showing by the differences of its marking the prevalence of rain, snow, or clear blue sky, or the amount of cloudiness at the time represented by the chart. The indications by the barometer and the thermometer are also shown in the figures upon each area. The direction of the wind is given by means of a particular symbol, which also admits of a modification by the addition of marks in its interior, to indicate the force of the aerial currents. In this way the series of ninety-three charts contained in Mr. Galton's book furnishes a comparative summary of the meteorology of a great part of Europe during the month to which it relates. Another series of corresponding small maps, divided into squares, gives, by means of symbols, a summary of the barometric indications at each period of observation, and the whole of the results are again brought together in a series of diagrammatic tables at the end of the book.

Obituary.

John Ashton Yates died on Sunday, Nov. 1, aged 82, at the Park, near Manchester. Mr. J. A. Yates was the second son of the late Rev. John Yates, minister of the Presbyterian congregation in Paradise-street, Liverpool. He was educated under the Rev. W. Shepherd, of Gateacre, and afterwards at the newly-instituted Manchester Academy, which in a few years assumed its present title of Manchester New College. To the close of life Mr. Yates was one of its supporters and principal officers. For instruction he was, however, chiefly indebted to the celebrated chemist and mathematician, John Dalton, who treated him not merely as a pupil, but as a friend. Mr. Ashton Yates was next apprenticed to the great North American firm of which William Rathbone was founder and chief. Mr. Yates's active habits as a Liverpool broker were varied and relieved by the study of literature and the fine arts, and he formed a very valuable collection of engravings and paintings by old masters. He also devoted great attention to political economy, and published "A Letter on the Distresses of the Country," 1817; "Colonial Slavery," 1824; "Essays on Currency and Circulation," 1827; "A Letter on the Present Depression of Trade and Manufactures, addressed to the Landowners and Farmers of the County of Carlow," 1841. At the time of their first appearance these pamphlets received warm approbation from Mr. Huskisson and many other politicians. On the passing of the Reform Bill Mr. Yates stood for Bolton, in his native county, but was not returned. At the next general election he was a candidate with Mr. Vigors for the county of Carlow, and they were returned together. He was elected a member of the Society of Arts in 1820.

James Haughton Langston, M.P., of Sarsden House, Chipping Norton, Oxon, and 143, Piccadilly, one of the members for the city of Oxford, died at Sarsden on the 19th Oct. He was the son of John Langston, Esq., of Sarsden-house, and was born in 1797. He was educated at Christ Church, Oxford, at which university he was created Honorary Doctor of Civil Law in 1819. In 1824 he married Lady Julia Moreton, daughter of Thomas, first Earl of Ducie. Mr. Langston's first appearance in the political world was in connection with the borough of Woodstock, where he was unseated. Mr. Langston afterwards was elected for the city of Oxford, heading the poll against Stonor Hughes and Wetherell. In 1835 he retired from political life, but came forward again in 1841, when he again headed the poll. In 1847 and 1852 he was returned without opposition, in company with Sir W. P. Wood. In 1857 he again stood a contest, with the same result as before. Mr. Langston was a liberal in politics, and a supporter of the ballot. He was elected a member of the Society of Arts in 1856.

Notes.

The Sunday in London.—A correspondent from Berlin writes as follows:—"This is Sunday in Protestant Berlin, and I have just heard an eloquent sermon in the Cathedral 'On the Anniversary of the Battle of Leipzig,' listened to by a congregation more attentive than you would find in St. Paul's. From the church I went to the Museum, to watch the crowds who, after church-time, came to see the pictures, the ancient marbles, and ethnography, and I could not help asking myself why the costermongers and working people in Protestant London should not be permitted to go to the British Museum or National Gallery, instead of boozing or lying in bed in their small, ill-ventilated rooms? Can you give any sound reason to your obedient servant,—F. S.?"

Great Value of Ground in the Metropolis.—A curious instance of this is shown opposite Lord Ellesmere's house, at St. James's. Apparently in order to economise about six inches, the side of a new building, which looks something like a stable and something like a chapel, has deviated from a straight line, and has a slight angle, which gives the appearance as though the wall had bulged.

Meteorology.—Mr. Glaisher, at a recent meeting of the Meteorological Society, entered into a series of very interesting details respecting the great storm of October 30, pointing out the extreme value of self-registering instruments. Those in use at Greenwich

showed that at half-past three in the afternoon of that day, when the railway shed at New Cross was blown down, the height of the barometer had suddenly fallen to 28·7 inches. The temperature as suddenly rose to 53° of Fahrenheit. The wind shifted from south to nearly due north, and the pressure of the wind was almost instantaneously raised to 29½ pounds on every square foot, 28 pounds being the greatest pressure that has been observed for more than thirty years previous. The self-registering instruments at Oxford indicated a similar series of phenomena nearly coincident in point of time.

FUR TRADE.—The *St. Paul's Press*, a Minnesota paper, states that the trappers killed last season 5,500 bison and buffaloes, upwards of 5,000 wolves, 850 bears, 1,131 foxes, 28,000 minks, 2,258 otters, 1,600 martins, and 250,000 musk rats.

BRITISH MUSEUM.—VENTILATION.—It is a common remark that a visit to this great national institution too often entails a headache and a sense of fatigue. Can this result be owing to the want of proper ventilation? Abundant hot air is poured in through gratings, but where the exit is to be found is not apparent. Certainly, besides the general stuffiness of the place, unpleasant odours assail the visitor frequently in a passage through the galleries.

THE WOOD CARVINGS just sent in competition to the Architectural Museum consist only of about a dozen examples of misereres, which are exhibited at the South Kensington Museum, in the Educational Museum.

LIVERPOOL FREE PUBLIC LIBRARY. — The Eleventh Annual Report states, that since the commencement of the library more than 2,400,000 volumes of books have been issued, and returned, with the exception of 59; 21 of these have been successfully traced and recovered, and 9 of the purloiners prosecuted to conviction; the cost of replacing the remaining 38 volumes has not exceeded £4, which sum represents the total loss of books from the opening of the library to the present time. The average issue is now upwards of 1,000 volumes per day.

MEMORIAL TABLETS.—The Board of Works (according to the *Builder*), when applied to for permission to place a marble tablet on the front of the house in Maiden-lane, Covent Garden, in which Turner was born and lived, refused to grant it. The applicants were artists, who had subscribed money for the purpose. As artists had this work in hand, it is not likely to have been open to the criticism of the Board of Works on æsthetic grounds, nor is the design likely to have been such as would endanger the building or interfere with the circulation of air in the neighbourhood. There must be some mistake, which ought to be corrected.

STREET LIGHTING.—The Parisians are just now giving much attention to this question, both as regards the amount of light as well as the form and disposition of the lamps. A considerable number of lamp-posts, of bronzed copper, deposited by the electrotype process, as carried on in the extensive factories of Oudry, are already put up in the principal streets. These lamp-posts are only about ten feet above the pavement, and above the flame is a circular reflector, by means of which the light is thrown horizontally and downwards, and prevented from being uselessly dissipated upwards. In London, too, experiments are being made to ascertain how the lighting may be improved and the cost economised by the use of the light petroleum oils for carburetting the street gas. A variety of plans have been devised for passing the gas through vessels containing the petroleum, and effectually charging it with the vapour. Various contrivances for this purpose have been attached to the street lamps in the City, and, as far as the experiments have at present gone, the results are favourable. This idea is not new, as many years since the "naphtha box," as it was termed, was suggested, and used with success by Mr. George Lowe, the well-known gas engineer, but the large importation of the cheap petroleum oils, offering a prospect of much greater saving, has caused public attention to be again attracted to the subject.

Home Correspondence.

AMERICAN FIRE-ARMS.

SIR,—In your *Journal* of October 23rd, page 760, is a short notice on this subject, in which it is stated that "The Armstrong gun, which obtained for its reputed inventor the honour of knighthood, was invented in this country (America) anterior to its appearance in Great Britain." I beg to add that the mode of constructing heavy ordnance, as adopted by Sir W. Armstrong, of wrought-iron in its strongest form—a spiral coil—was first described by me, and published in your *Journal* for November, 1854. Also that in January of the year 1855 I had the honour of laying before the Ordnance Select Committee at Woolwich my plan for the construction of wrought-iron guns on the principle of the spiral coil, and of which plan and specification the Board of Ordnance is still in possession, three years before the date of Sir W. Armstrong's first patent. And, further, that subsequently I procured a petition to be laid before Parliament having reference to my prior claim, with a detailed drawing of my own gun appended thereto, together with the same principle as applied to the side-wedge breech-loader, also my own plan, which Sir W. Armstrong has lately put forward as an invention of his own. The dimensions of my gun, five feet six inches across the breech, are extraordinary, but nothing less will be sufficient to resist the explosion and recoil of the extravagant range, weight of shot, and initial velocity now required by the artillerists of all countries. But if the ordinary sixty-eight pounder practice only be required, then my muzzle-loader ten inch gun will have the same form and dimensions as those hitherto constructed for such practice on the old established pattern. The public prints are loud in their complaints of the failure of the Armstrong guns, at a cost to the nation, they say, of something like three millions; but if Sir W. Armstrong had carried out my invention in all its parts, I presume to think that we should have heard very little of such failures. I am, &c.,

HENRY W. REVELEY.

Reading, November 19th, 1863.

MEETINGS FOR THE ENSUING WEEK.

MON. ...R. Asiatic, 3.
R. Inst. of British Architects, 8.
Medical, 8½. Dr. C. H. F. Routh, "Diseases of Women and Children." 2nd Lecture.
Inst. of Actuaries, 7. Mr. S. Brown, "On the Recent Proceedings of the International Statistical Congress at its meeting at Berlin."

TUES. ...Geologists' Assoc., 7. 1. Mr. Roberts, "On some new localities for Fossil Fishes in the North of Scotland." 2. Mr. G. H. West, "On the Geology of Rugby."
Civil Engineers, 8. Renewed Discussion upon Mr. Morshead's paper, "Duty of the Cornish Pumping Engines." And, time permitting, Mr. Peter William Barlow, "Lambeth Bridge."

WED. ...Society of Arts, 8. Mr. F. H. Holmes, "On Magneto-Electricity and its Application to Lighthouse Purposes."
Geological, 8. 1. Herr Adolf von Koenen, "On the Correlation of the Oligocene Deposits of Belgium, Germany, and Southern England." Communicated by Mr. F. E. Edwards. 2. Mr. Ralph Tate, "On the Liassic Strata of the Neighbourhood of Belfast." 3. Mr. W. R. Swan, "On the Palæozoic Strata in the Vicinity of the Bosphorus." Communicated by Sir R. I. Murchison.
Pharmaceutical, 8½. 1. Professor Bentley, "On a new kind of Matico." 2. Mr. Henry Deane, "On the Acetic Acids of the Three Pharmacopœias." 3. Mr. C. R. C. Tichborne, "Upon the Administration of Bismuth in a Soluble Form." 4. Mr. David S. Kemp, "On Goa Powder." 5. Mr. T. B. Groves, "Note on the Recovery of Essential Oils from their Watery Solution." 6. Mr. John Eliot Howard, "Note on the Root-Bark of Calisaya." 7. Mr. Daniel Hanbury, "Note on *Cassia moschata*."

THUR. ...Royal, 8½.
Linnæan, 8.
Chemical, 8. 1. Dr. Gladstone, "Essential Oils." 2. Drs. Frankland and Duppa, "New Mode of Preparing Zinc Ethyl."

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, November 13th*, 1863.]

Dated 31st October, 1863.

2703. J. Getty, Temple-street, Liverpool—Imp. in building ships and vessels.
2705. W. Pope, Bristol—Imp. in machinery for breaking or crushing stone.

Dated 2nd November, 1863.

2711. W. E. Newton, 66, Chancery-lane—Imp. in clock-work movements. (A com.)

Dated 3rd November, 1863.

2717. R. Eaton, Stockport—Imp. in machinery for ruling or marking leather.
2719. J. P. Booth, Cork—Imp. in beds and bedding.

Dated 4th November, 1863.

2723. P. A. Sautreuil, Fecamp, France—An improved apparatus for the lubrication of bearings, shafts, and other parts of machinery subject to friction.
2725. J. Thomas, Battersea—Imp. in preparing ores and earths containing copper for smelting.
2731. J. A. Barral and L. A. Cochery, 10, Rue de la Fidélité, Paris —Certain imp. in the manufacture of manure.

INVENTION WITH COMPLETE SPECIFICATION FILED.

2728. J. Tangye, Birmingham—Imp. in portable hydraulic shearing and rivetting machines.—4th November, 1863.
2768. J. K. Hoyt, 12, Southampton-buildings, Chancery-lane—Imp. in revolving fire arms. (A com.)—7th November, 1863.
2779. G. Haseltine, 12, Southampton-buildings, Chancery lane—An improved machine for bending metallic pipes or spouts. (A com.)—7th November, 1863.

[*From Gazette, November 20th*, 1863.]

Dated 24th August, 1863.

2093. L. Guillemot, 42, Rue du Moulin à Vent à Poitiers, France—An improved machine for obtaining perpetual motion.

Dated 25th September, 1863.

2362. C. de Wailly, 1A, Florence-street, Upper-street, Islington—An improved slipper or clog principally intended for bath rooms.

Dated 10th October, 1863.

2486. S. Banner, Liverpool—An improved mode or method of storing petroleum and other like oils and spirits.

Dated 12th October, 1863.

2502. C. Humfrey, jun., St. David's Works, Saltney, Flintshire—Imp. in the means and method of purifying hydro-carbons.
2504. G. Mountford, Brunswick-street, Leeds—An improved construction of cotton gin.

Dated 14th October, 1863.

2523. R. H. Smithett, King's Bench-walk, Temple—Imp. in the application of wheels to railway carriages.

Dated 15th October, 1863.

2530. S. Flexen, 46, Skinner-street, Snow-hill—An improved apparatus for ventilating railway and other carriages, houses, buildings, steam and sailing vessels of all kinds, moveable or otherwise.

Dated 17th October, 1863.

2543. Y. Meirat, Henry-street, Hampstead-road—Imp. in the means of propelling vessels.

Dated 22nd October, 1863.

2595. J. Craven and S. Fox, Leeds—Imp. in machinery or apparatus for punching, shearing, and burnishing.

Dated 23rd October, 1863.

2612. B. Marriott, 33, Upper-street, Islington—An imp. in watches, consisting in the construction of cylindrical dead beat independent centre seconds watches.

Dated 27th October, 1863.

2650. J. C. Wilson, 14A, Cannon-street—A new mode of mounting ordnance, and the machinery and apparatus for working said ordnance, and for loading, cleaning, and counteracting the recoil when fired.
2652. E. G. Atherley, Orme-square, Bayswater—Obtaining motive power by certain arrangements of machinery and water.

Dated 30th October, 1863.

2682. J. Haworth, 15, Hart-street, Bloomsbury—Imp. in the improved method of conveying electric signals and telegrams without the intervention of any continuous artificial conductor.
2686. F. Durand, Paris—Imp. in cotton gins.
2690. B. Russ, Bristol—Imp. in the construction of iron and other ships, vessels, and batteries of war, and of cupolas and armour plates applicable thereto, parts of which imp. are also applicable to other useful purposes.

Dated 31st October, 1863.

2698. A. Wasserburgen and T. Bessunger, 9, Calvert-street, Shoreditch—Imp. in the manufacture of show cards, window tickets, and ornamental labels as advertising mediums.
2699. S. H. Parkes, Birmingham—Imp. in opera glasses, telescopes, microscopes, spectacles, and other optical instruments.
2700. W. Tasker, jun., Upper Clatford, Southampton—Imp. in the making of safety paper, and in the machinery or apparatus employed therein.
2706. J. Wilson, Upper Poppleton, Yorkshire—Imp. in thrashing machines.
2707. S. Holman, 18, Cannon-street—Imp. in machinery for raising and forcing fluids, parts of which improvements are also applicable to steam engines, blast engines, exhausters, and other machines.

Dated 2nd November, 1863.

2710. F. J. Vandenvinne, 37, Rue aux Laines, Brussels—Imp. in machinery for excavating land, making cuttings, and other earthworks.
2712. T. F. Wintour, Clifton, near Bristol—Imp. in ventilators and fire-guards.

Dated 3rd November, 1863.

2713. T. W. Alderton, Ipswich—Imp. in sewing machines.
2714. F. J. Pastorelli, 208, Piccadilly—Imp. in the construction of surveyors' levels and other surveying instruments.
2718. S. Bateman, Asnieres, France—Imp. in machinery for combing wool and other fibrous substances.
2720. J. J. Revy, 28, Grosvenor-street, Eaton-square—Imp. in the manufacture of explosive compounds.
2721. M. Henry, 84, Fleet-street—Imp. in the manufacture of zinc white. (A com.)

Dated 4th November, 1863.

2722. J. Livesey, 75, Cannon-street-west, and J. Edwards, 29, Basing hall-street—Imp. in the permanent way of railways, and fastenings for the same.
2724. G. Ville, Paris—Imp. in treating natural phosphates of lime for agricultural purposes.
2726. E. Hughes, Bagillt, Flintshire—Imp. in fans for forcing and exhausting air or other gases.
2727. C. Howe, jun., 8, Ludgate-street—Imp. in sewing machines.
2730. A. Gillett, Highway Farm, Berkshire—Imp. in machines for cutting chaff and such like substances.
2732. J. H. Maw, Broseley, Shropshire—Imp. in the application of preservative coatings or compositions to the bottoms of ships and vessels.

Dated 5th November, 1863.

2736. J. Northrop, Thornton, near Bradford, Yorkshire—An improved apparatus for making fringes.
2737. E. K. Dutton, Stretford, Chester—Certain imp. in apparatus for coating or covering the surfaces of rollers or cylinders with leather or other material.
2738. T. Farra, Manchester—Certain imp. in "skirtings" employed as wearing apparel.
2741. W. Prodger, George-street—Imp. in lanterns and lamps for the same.
2742. H. Hancock, 28, Claylands road, Clapham-road, and W. H. Vickers, 24, Blackman-street, Borough—A new system of fastening for doors, windows, safes, chests, and other similar purposes.
2743. J. Whitworth, Manchester—Imp. in the treatment and application of steel and homogeneous metal.
2744. H. Bessemer, Queen street-place, New Cannon-street—Imp. in the manufacture of railway bars.
2745. S. Smith, Hyson Green Brass Works, near Nottingham—Imp. in safety valves for steam boilers, and in valves and taps for regulating the flow of fluids.
2746. H. Bessemer, Queen-street-place, New Cannon-street—Imp. in the manufacture of malleable iron and steel, and in the apparatus employed in such manufacture.
2747. R. T. Tait, 10, Essex-street, Strand—Imp. in the manufacture of woollen garments.
2748. G. Speight, 5, St. John-street-road, Clerkenwell—An imp. in collars and cuffs.
2749. F. E. Sickles, Bute-street, Brompton—An improved mode of and apparatus for steering and turning vessels.

Dated 6th November, 1863.

2750. C. D. Abel, 20, Southampton-buildings, Chancery-lane—Imp. in fluid meters. (A com.)
2751. C. Coates, Sunnyside, near Rawtenstall, Lancashire—Certain imp. in machinery for printing cotton and other fabrics.
2753. J. Muckart, Letham Mill, near Arbroath, N.B.—Imp. in preserving certain vegetable substances.
2754. W. Davies and G. Cate, 151, North-street, Old-road, Stepney —Imp. in machinery for cutting corks, bungs, gun wads, and other similar articles.
2755. C. H. Southall and R. Heap, Staleybridge, Lancashire—Imp. in self-acting machinery or apparatus worked by steam or other power, for cutting and shaping the soles and heels of boots and shoes and screwing them on to the uppers or coverings, and also in vices for holding the same, and tools for paring, blacking, and glazing, or otherwise ornamenting the edges of the soles and heels.
2757. J. S. Guirette, Paris—An improved inhaling apparatus.
2758. J. Townsend, Glasgow—Imp. in the manufacture of nitrate of potash.

2759. W. M. Neilson, Glasgow—Imp. in axle boxes. (Partly a com.)
2761. G. M. Campbell, Stoke-upon-Trent—Imp. in apparatus for drying plates and other articles of china and earthenware.
2762. W. H. Perkin, Seymour-villa, Sudbury—Imp. in the manufacture of colouring matters suitable for dyeing and printing.
2763. R. Johnson, Manchester—Imp. in testing the strength of wire for telegraphic and other purposes.

Dated 7th November, 1863.

2765. H. L. Emery, 72, Sloane-street Chelsea—Imp. in machinery for ginning and cleaning cotton, a part of which are applicable to machines for other purposes.
2766. T. C. Barraclough, Manchester—Certain imp. in looms for weaving. (A com.)
2767. R. Batt, Waterhouse Mill, Milnthorpe, Westmoreland—Improved arrangements of paper-making machinery.
2769. J. Johnson, Peterborough—Imp. in apparatus for lubricating the cylinders and other parts of steam engines.
2771. L. Braham, Hatton-garden — Imp. in spectacles and hand frames.
2772. W. Clark, 53, Chancery-lane—An imp. in sewing machines. (A com.)
2773. G. S. Melland, Lime-street—Imp. in breech-loading fire-arms and ordnance. (A com.)
2775. A. Barclay and A. Morton, Kilmarnock, Ayr, N.B.—Imp. in certain apparatus for injecting and ejecting fluids.
2778. M. Mellor, Nottingham—Imp. in machinery or apparatus for the manufacture of looped or knitted fabrics.

Dated 9th November, 1863.

2781. H. Mege, 10, Rue de la Fidelite, Paris—Certain imp. in the manufacture of soap.
2782. W. J. Cunningham and H. Connop, Everett-terrace, Victoria Dock-road, Essex—Imp. in sawing machines.
2783. G. T. Bousfield, Loughborough-park, Brixton—Imp. in the construction of ships and vessels. (A com.)
2784. N. Thompson, Abbey-gardens, St. John's-wood—Imp. in apparatus for stopping bottles and other vessels.
2785. G. Ryder and M. Gutteridge, Leicester—Imp. in hay making machines.

Dated 10th November, 1863.

2787. T. Weston, 5, Montague-street, Dublin—Imp. in printing presses.
2788. J. C. Habicht, 4, South-street, Finsbury—Certain imp. in keyless watches. (A com.)
2789. G. Yates, Wolverhampton—Imp. in the machinery to be used in the manufacture of heel tips and toe tips and toe plates for boots and shoes.
2790. J. Ramsbottom, Accrington, Lancashire—Imp. in machinery or apparatus for measuring or registering fluids, and in obtaining motive power from the same.
2791. S. J. Bartlett, Maidstone—Imp. in taps.
2792. H. A. Bonneville, 24, Rue du Mont Thabor, Paris—An improved cowl or chimney pot. (A com.)
2793. F. Castlenau, Villefranche, Haute Garonne, France—Imp. in the construction of two wheeled vehicles or carriages.
2794. J. Mash, Bowden, Cheshire—Imp. applicable to safety valves and pressure or temperature gauges.
2795. S. Faulkner, Blackley, J. Berry, Newton Heath, and G. Harrison, Blackley, Lancashire—Imp. in apparatus for grinding cards used in carding engines.
2796. S. Faulkner, Blackley—Imp. in carding engines.
2797. J. Cutler, Gloucester-road, Upper Holloway—Imp. in the construction of ornamental fountains.

Dated 11th November, 1863.

2801. T. M. Reade, Liverpool, and J. Hewitt, Stanley, near Liverpool—Imp. in the apparatus for regulating and controlling the supply of water to water-closets and other purposes.
2802. J. Fottrell, Liverpool—Imp. in deodorising petroleum and other mineral oils.
2803. D. Dawson, Huddersfield—Imp. in the production of colours for dyeing.
2805. H. Melton, Regent-street—Imp. in shakos, military and other hats and caps.
2807. M. Stainton and D. Lawson, South Shields—Imp. in apparatus for steering ships and vessels.
2808. W. Clissold, Dudbridge Works, near Stroud—Imp. applicable to machinery for opening, cleaning, preparing, and carding wool and other fibrous substances.
2809. G. Haseltine, 12, Southampton-buildings, Chancery-lane—Imp. in endless chain horse powers. (A com.)

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

2806. W. D. Richards, Morley's Hotel, Charing-cross—Imp. in caloric or heated air engines. (A com.)—11th November, 1863.
2818. E. Rowland, Manchester—Certain imp. in apparatus for weighing solid bodies and for measuring fluids, parts of which imp. are also applicable to the opening and closing of dampers.—12th November, 1863.

PATENTS SEALED.

[*From Gazette, November 20th*, 1863.]

18th November.
1240. E. Christmas.
1249. S. Rhodes.
1258. T. P. Salt.
1261. H. Wren and J. Hopkinson.
1268. J. Cassell.
1279. J. Fawcett.
1282. W. Snell.
1284. T. A. Blakely.
1286. T. A. Blakely.
1287. G. Stevens.
1290. J. Higgins and T. S. Whitworth.
1295. W. Cormack.
1297. J. S. Bickford & G. Smith.
1300. F. Potts and J. Key.
1312. G. Kottgen.
1313. H. B. Girard.
1315. J. Hilliar.
1330. A. Bastow.
1399. F. A. Calvert.
1403. T. Gray.
1405. W. Clark.
1413. W. C. Brocklehurst, J. Creighton, C. Makinson, and J. Creighton.
1422. R. C. Furley.
1448. M. Hatschek.
1539. J. Watts.
1692. G. Haseltine.
1762. W. Wood.
1998. C. C. Dennett.
2152. A. V. Newton.
2205. J. C. Lott.
2223. N. Thompson.
2314. I. De Angelis.

20th November.
1292. J. Sturgeon.
1301. R. A. Brooman.
1303. R. A. Brooman.
1304. F. Kingsbury.
1305. G. Smith.
1311. E. Hunt.
1322. J. Munro and R. Scott.
1365. W. Clark.
1880. H. A. Bonneville.

[*From Gazette, November 24th*, 1863.]

24th November.
1318. M. J. Roberts.
1321. A. Haley.
1331. H. C. Coulthard.
1333. C. Gammon.
1334. W. Palliser.
1340. H. Cartwright.
1342. T. Richardson & R. Irvine.
1343. F. Osbourn.
1346. R. A. Brooman.
1349. A. Abadie.
1350. W. Loeder.
1351. J. J. Potel.
1352. G. H. Pierce.
1354. W. Green.
1364. J. Chalmers.
1387. G. Davies.
1429. B. Dobson and D. Greenhalgh.
1457. W. Walton.
1460. E. O. Hallett.
1476. G. Davidson.
2162. G. T. Bousfield.
2317. T. E. Vickers.
2356. J. Webster.
2397. E. W. Bullard.
2473. L. Lefebvre.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, November 24th*, 1863.]

16th November.
2885. S. Walker, jun.

17th November.
2837. O. Vandenburgh.
2845. A. V. Newton.
2933. W. M. Storm.

19th November.
2862. R. Jobson.
2867. G. E. Dering.
2889. J. Fowler, jun., R. Burton, and D. Greig.
2895. G. F. Train.

20th November.
2891. W. Leigh.

21st November.
2857. C. Myring.
2861. W. H. Ralston.
2865. D. Auld.
2874. B. Beniowski.
2886. J. H. Johnson.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

[*From Gazette, November 24th*, 1863.]

16th November.
2782. J. Broadley.

19th November.
2768. A. Clark.
2840. G. Collier & J. W. Crossley.

20th November.
2767. T. Roberts, J. Dale, and J. D. Pritchard.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietor's Name.	Address.
4596	Nov. 13.	A Tobacco Pipe ..	Thos. R. Whitcombe	Victoria-street, Manchester.
4597	„ 21.	Sofa, Bench, or Seat for Railway Carriages.	Wm. Brown	Enoch-square, Glasgow.
4598	„ „	Improved Fastener for Tables and other purposes	Thos. Atkins	Bartholomew-row, Birmingham.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, DECEMBER 4, 1863. [No. 576. VOL. XII.

Announcements by the Council.

ART-WORKMANSHIP.

The works submitted in competition for the Prizes offered by the Society amount to seventy in number, and are now placed for the inspection of members and their friends, in the Society's Great Room, where they will remain until Christmas, when, with the view of their being exhibited to the general public, they will be removed to the South Kensington Museum, by permission of the Science and Art Department. The works are as follow:—

1. *Modelling in Terra Cotta, Plaster, or Wax.*

(*a.*) The Human Figure in bas relief, after Rafaelle's design of the "Three Graces."—23 works.

(*b.*) Ornament in bas relief, after arabesques by Lucas van Leyden, 1528.—8 works.

2. *Repoussé Work in any Metal.*

(*a.*) The Human Figure as a bas-relief, after Rafaelle's "Three Graces."—3 works.

(*b.*) Ornament, after a Flemish salver in the South Kensington Museum, date about 1670.—1 work.

3. *Hammered Work, in Iron, Brass, or Copper.*

Ornament, after an iron German arabesque, about 1520, in the South Kensington Museum.—2 works.

4. *Carving in Ivory.*

The Human Figure in bas relief, after a terra cotta ascribed to Luca della Robbia, about 1420, in the South Kensington Museum.—4 works.

5. *Chasing in Metal.*

(*a.*) The Human Figure, after a reduced copy of Gibson's Psyche.—6 works.

(*b.*) Ornament, after a bronze plaque in the South Kensington Museum.—11 works.

6. *Enamel Painting on Metal, Copper, or Gold.*

(*a.*) The Human Figure, after Rafaelle's design of the "Three Graces," executed in grisaille.—None.

(*b.*) Ornament in grisaille, after a German arabesque, 16th century.—1 work.

7. *Painting on Porcelain.*

(*a.*) The Human Figure, after Rafaelle's "Boy bearing Doves," in the cartoon of the "Beautiful Gate."—5 works.

(*b.*) Ornament, after arabesques by Lucas Van Leyden, 1528.—3 works.

8. *Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.*

(*b.*) Ornament, after a majolica plate in the South Kensington Museum, 1490.—2 works.

9. *Engraving on Glass.*

(*b.*) Ornament, after arabesques by Lucas Van Leyden, 1528.—None.

10. *Embroidery.*

Ornament, after a German example in the Green Vaults at Dresden.—1 work.

The Council have requested Mr. Richard Redgrave, R.A., Mr. Digby Wyatt, M.R.I.B.A., and Mr. John Webb to act as judges in awarding the prizes.

The Council, considering the shortness of notice given to competitors, and the difficulties of making the subject sufficiently known, view the present as a satisfactory beginning, and they have re-appointed the Committee to consider the preparation of conditions for the next competition.

EXAMINATIONS.

The Local Board of the Polytechnic Institution has offered to give a prize of £3, provided the subject of Italian be included in the Examination Programme, and a suggestion has been made that Geology might also be advantageously added to the list of subjects. As the Programme for 1864 has already been issued, the Council are unable to make any addition to it, but they would be glad to know the opinions of Local Boards as to the advisability of adopting either or both these suggestions in a future year.

Wednesday evening Meetings previous to Christmas. Chair taken at 8 o'clock.

DEC. 9.—"Agricultural Progress: its Helps and its Hindrances." By J. CHALMERS MORTON, Esq. On this evening JOHN GREY, Esq., of Dilston, will preside.

DEC. 16.—"On the Economic Value of Foods, having special reference to the Dietary of the Labouring Classes." By Dr. EDWARD SMITH, F.R.S.

Courses of Lectures (under the title of "the Cantor Lectures") on the following subjects, will be delivered during the Session:—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. HASTINGS, Esq., Barrister-at-Law.

Fine Arts Applied to Industry. By W. BURGES, Esq.

Chemistry Applied to the Arts. By Dr. F. CRACE CALVERT, F.R.S.

The following is the syllabus of Mr. Hastings' Course, which will consist of four lectures :—

SUBJECTS OF THE TWO LECTURES ON DEC. 7TH AND 14TH, AT 8 O'CLOCK.

Nature and Objects of Public International Law.
Its Connexion in the Interests of International Commerce.
The Law of Naval Blockade, its Origin, History, and Present Condition.
Its Effects on International Commerce.
Arguments for and against the continuance of Commercial Blockades.

SUBJECTS OF THE TWO CONCLUDING LECTURES TO BE DELIVERED AFTER CHRISTMAS.

Contraband; its Nature and Usages.
Capture of Private Property at Sea; present State of the Law as modified by the Declaration of Paris; Arguments for and against its Continuance.
The Foreign Enlistment Act; its Operation on Commerce.

Proceedings of the Society.

THIRD ORDINARY MEETING.

Wednesday, December 2nd, 1863; Dr. W. A Miller, F.R.S., Professor of Chemistry, King's College, London, in the chair.

The following candidates were proposed for election as members of the Society :—

Atkinson, George, 2, Highbury-park, N.
Baker, Edward, 36, Great Ormond-street, W.C.
Baring, Thomas, M.P., F.R.S., 41, Upper Grosvenor-street, W.
Blackburne, Rev. Thomas, Club-chambers, 15, Regent-street, S.W.
Buckland, Wm. John, Drummond-chambers, John-street, Adelphi, W.C.
Cook, Henry, Cannon-road, Brighton.
Engel, Louis, 31, Grosvenor-street, W.
Enkyn, Roger, 13, Upper Grosvenor-street, W.
Hammond, C. D., M.D., 11, Charlotte-street, Bedford-square, W.C.
Heaton, Charles, Bradford-house, Bolton.
Hill, John, 19, Tavistock-square, W.C.
Holtum, William, Church-street, Walmer.
King, William D., 148, Queen-street, Portsea.
Lewal, Gabriel, 5 and 6, Philpot-lane, E.C.
Martin, Henry A., 64, Berwick-street, Oxford-street, W.
Robinson, Vincent J., Douglas-villa, Carlton-hill, N.W.
Rogers, E. S., Victoria Oil Works, Collyhurst-road, Manchester.
Schiele, C., 2, Clarence-buildings, Booth-street, Manchester.
Sturman, Edward Albert, Camden-house, Sydenham-park, S.W.
Weatherley, Christopher, 39, High-street, Wapping, E.
Yates, W. S., Stamford-street, North-street, Leeds.

AND AS HONORARY CORRESPONDING MEMBER.

Kelaart, William Casper, Trinidad.

The following candidates were balloted for, and duly elected members of the Society :—

Adams, Benjamin, Bank of England, E.C.
Aitchison, David, 180, Piccadilly, W.
Bachhoffner, Dr. George Henry, F.C.S., 204, Marylebone-road, N.W.
Bagshaw, William E., 3, Compton-terrace, Islington, N.
Baker, George, 8A, Lucknow-terrace, Bayswater, W.
Ball, Walter F., 3, St. John's-park-villas, N.W.
Bankart, James, 10, Trinity-square, S.E.
Bass, Michael Thomas, M.P., 19, Lower Belgrave-street S.W.; and Rangemore, Burton-on-Trent.
Berrall, Wm., 39, Bedford-street, Covent-garden, W.C.
Bewick, Thomas John, Allenheads, Northumberland.
Blackbourn, John, 6, Trinity-terrace, Trinity-square, Brixton, S.
Blockley, John, 2, Park-road, Haverstock-hill, N.W.
Blyth, Alfred, 38, Westbourne-terrace, W.
Boehm, J. Erasmus, 28, Brompton-crescent, S.W.
Bond, Francis T., M.D., Hartley Institution, Southampton.
Bowkett, Thomas E., 2, Folkestone-terrace, Poplar, E.
Bowman, Robert, 10, Church road West, Islington, N.
Boyd, Dr., 10, Norfolk-terrace, W.
Bryson, John Miller, 57, Roupell-street, Lambeth, S.
Buckland, Francis T., M.D., 156, Albany-street, N.W.
Burgh, Nicholas, 78, Waterloo-road, S.
Burnell, Edward H., 32, Bedford row, W.C.
Burt, Major Thomas Seymour, F.R.S., 18, Wilton-place, Regent's park, N.W.
Busher, Edward D., 11, St. Leonard's-terrace, Chelsea College, S.W.
Bussey, Geo. G., 14, Eton-villas, Haverstock-hill, N.W.
Butler, Charles, F.R.G.S., 13, Sussex-sq., Hyde-park, W.
Butt, I., Q.C., M.P., 8, Broad Sanctuary, Westm., S.W.
Buttery, Charles, 173, Piccadilly, W.
Cardwell, Reginald, 11, Cromwell place, South Kensington, W.
Chorley, Thomas Fearncombe, 48A, Moorgate-street, E.C.
Clark, Edward Rawson, Drayton-villa, West Brompton, S.W.
Cleland, W., 24, Circus-road, St. John's-wood, N.W.
Coe, Ernest Oswald, 7A, Brook-st., Grosvenor-square, W.
Cole, Edward S., 6, Thurloe place, Brompton, S.W.
Collinge, Arthur, C.E., 10, Marlborough-place, Kennington, S.
Cooke, Christopher, 13, Chatham-place, E.C.
Cooke, Major Anthony, R.E., 95, Mount-street, Grosvenor-square, W.
Cope, William, 26, Gloucester-cres., Regent's-park, N.W.
Corderoy, George, 17, King William-street, Strand, W.C.
Corderoy, John, 3, Kennington-green, S.
Cronmire, John Martin, 10, Bromehead-street, Commercial-road-east, E.
Currie, Edmund Hay, Bromley, Middlesex, E.
Davis, Matt. Boulton, 22, Buckingham-st., Strand, W.C.
Dunn, Spencer, 10, King-street, Finsbury, E.C.
Emly, Samuel Frederick, 12, Norfolk-st., Strand, W.C.
Evans, John E., 6, Albion-road, Hampstead, N.W.
Evans, John Hilditch, 60, Bartholomew Close, E.C.
Faulkner, John, 2, Mornington-crescent, N.W.
Field, Sidney, Northcote, Reigate.
Fisher, Joseph, Great Western Railway Station, Paddington, W.
Fletcher, Isaac, Tarnbank, Workington.
Greig, Alexander M., Ranelagh-road, Pimlico, S.W.
Guye, Auguste, 8, Guildford street, Russell square, W.C.
Hammond, Edwin, 23, Hamilton-street, Camden-town, N.W.
Harris, Wm. H., F.C.S., 33, Gold-street, Northampton.
Hewitt, Jonas B., 5, Angel-court, E.C.
Highton, T. Charles, 32, Norfolk-street, Strand, W.C.
Hill, Nicholas Stanton, Liverpool.
Hunter, Christopher, 34, Penton-street, Pentonville, N.
Kayess, William Henry Tucker, 23, Milk-street, E.C.; and Forest-hill, S.E.
Kindersley, Septimus Wigram, 38, Chapel-street, Belgrave-square, S.W.
Lorberg, W., Ph. D., 4, Wyld's-rents, Bermondsey, S.E.
Maclean, William, Grove hill, Camberwell, S.
Marsden, Joseph Daniel, Edmonton, N.
Martin, Charles, 11, Langham place, W.

Michael, Jacob, Southfield-lodge, Southfields, Wandsworth, S.W.
Middleton, James, 2, Brook-street, Gloucester-place, W.
Oakley, William, High-street, Bromley, E.
Potter, William, 10, St. John's-wood-park, N.W.
Punshon, Rev. Wm. Morley, M.A., 8, Arundel-square, Islington, N.
Purdue, Thomas, Witney, Oxfordshire
Randell, Charles, 51, Rutland-gate, S.W.
Rucker, Martin Diederich, 115, Leadenhall-street, E.C.
Sabine, Robt. 39, Bessborough-gardens, Belgrave-rd. S.W.
Shaw, James Veitch, The Elms, Twickenham, S.W., and Knight Rider-street, Doctors' Commons, E.C.
Stubbs, John Heath, Bennett's-hill, Birmingham.
Smith, Edward, M.D., F.R.S., 16, Queen Anne-street, Cavendish-square, W.
Tatam, William, Langriville, Boston, Lincolnshire.
Taylor, Walter, Ranelagh-road, Pimlico, S.W.
Tupp, John, 27, Oxford-street, W.
Tylee, John, Bridge-street, Bath.
Watt, James, Caithness, Pavement Quarries, and Mount Pleasant, Thurso, N.B.
Weir, Edward, 142, High Holborn, W.C.
White, George, 70, Russell-square, W.C.
Winter, James, 100, Wardour-street, W.
Wolff, Sir Henry Drummond, K.C.M.G., The Albany, W.

The Paper read was—

ON MAGNETO-ELECTRICITY, AND ITS APPLICATION TO LIGHTHOUSE PURPOSES.

By F. H. Holmes, Esq.

As this is a paper on the Application of Magneto-Electricity to Lighthouses, I will begin by saying a few words on lighthouses themselves, their former and present state, and the systems now generally followed in the arrangements for lighting.

Formerly lighthouses were very few, and were nearly all coal fires on high cliffs or towers, and most of them were the property of private individuals; but, as shipping increased, so the lighthouse system became more and more developed, both in the number of lighthouses and in the improvement of those already existing. The coal fire gradually gave way to the oil lamp and candles; next we find the introduction of spherical mirrors or reflectors, and these, again, were superseded by parabolic reflectors, sometimes to the number of more than thirty in one lantern. After this came the introduction of the "Fresnel Lens," which took the place of the reflectors and their lamps, however numerous they might be, and required instead one central lamp.

This "Fresnel Lens" has again grown, so to speak, larger and larger, as the want of a more powerful light was felt, till it has now a diameter of six feet and a height of ten, for to increase the quantity of light the size of the lamp must be increased, and the lens in proportion, or it would have been so far out of focus that the intention of the lens would have been frustrated.

To make these progressive improvements in lighthouses vast sums of money had to be expended; and now let us see what was the end sought. First to improve the light itself. This is done by the substitution of a lamp of four concentric wicks, the largest nearly four inches in diameter, for the coal fire. If the improvement had stopped at that it would have been small indeed, but this lamp is more under command than the coal fire. The value of the introduction of oil is not so much, then, on account of its greater power as for its aptitude for the employment of economising apparatus, whether this consists of reflectors or lenses. All incandescent bodies give out rays as it were from the centre to the circumference of a sphere; of such rays only those which fall on the sea would be useful to the mariner, but by means of reflectors those rays which would pass inland, or upwards, or downwards, are reflected towards any required point, and by a proper arrangement of a series of reflectors, the whole or nearly the whole of the rays are directed where required. The Fresnel lens consists of a middle refracting belt, and a double series of reflecting prisms, or zones, as they are generally termed, and, when properly constructed, it has the property of collecting all the rays into one horizontal beam, so that all the light from the lamp is utilised. Thus, then, we see great strides have been made, since the introduction of oil lamps, as regards the lenticular apparatus—in fact that may be said to be nearly perfect; let us then return to the consideration of the light itself for a moment.

Whether a large or a small lamp be employed it will make no difference in misty weather, so long as the thickness of the flame is the same, for a large lamp may be equal to ten or twelve smaller ones, and, if replaced by these ten smaller, it will be evident that when one of these is obscured by mist the whole of them will be obscured. Quantity of light, then, will not add to its power of penetrating mist. By making the large lamp with four concentric wicks, the intensity of the light is a little increased, and such a lamp will penetrate further through mist in a slight degree. But it is in misty and hazy weather that the light is most required; hence, now that everything else is nearly perfect in a lighthouse, the authorities, both in this country and elsewhere, are directing their attention to the only thing wanting to make the whole system perfect, that is, a light capable of penetrating mist; and as this power depends on the intensity of the light, and electricity is capable of producing the most intense light known, it was naturally looked to as the possible means of perfecting the whole system. But the light produced by electricity to be applicable for lighthouses must be certain and constant, not liable to extinctions or any great variations, as the first would tend to endanger vessels seeking and not finding the light; and if a fixed light had much variation, it might be mistaken for a revolving light.

Let us now see whether electricity can produce a constant steady or uniform light. Frictional electricity will give a succession of flashes intensely vivid, and might be used for the purpose, but for the fact that the slightest moisture is sufficient to convey the whole charge to the earth. The various forms of galvanic battery are all capable of producing a steady and intense light, but still (besides the great expense) they are not applicable, because of the necessarily varying current, which becomes weaker and weaker as the solution becomes saturated. The magneto-electric machine is then the source from which one would naturally expect a light which should be invariable in its nature, and capable of being continuous for any given time, as the current produced by this machine is constant as long as the helices revolve with the same speed, and the speed can be easily regulated to any required velocity.

The electricity derived from a magneto-machine is induced in coils of wire, by the changing of the magnetic polarity of pieces of soft iron inclosed within the coils or helices; and the quantity or intensity of the induced current depends first, on the amount of magnetism induced in the soft iron; secondly, on the facility with which the poles of the magnetised soft iron can be reversed; thirdly, on the velocity with which the change of polarity takes place; fourthly, on the length and diameter of the wire forming the helices.

The amount of magnetism induced in the soft iron depends on the size and force of the steel magnets employed, and on the weight and softness of the iron in the helices; but the weight in practice of the soft iron is limited by the weight of the steel magnets, for, if too heavy, the steel magnets will be slowly deprived of their magnetism. To facilitate the change of the poles the soft iron cores of the helices are not solid pieces of iron, but are tubes, single, double, or treble, as it is found by experiment that the same weight of iron, when divided in this manner, loses or takes magnetism in much less time than when in a solid form.

There is a limit to the velocity to be employed when the maximum of electricity is required, for this reason. It has been already remarked that the amount of electricity depends on the amount of magnetism taken up, and that the soft iron takes time to become saturated, as it may be termed, with magnetism; hence, if the velocity be too great with which the cores move from one pole of a magnet to another, there will not be sufficient time for the cores to become saturated. But as again the quantity of electricity increases as the velocity increases, it is necessary to ascertain this maximum point exactly, which is easily done, either by experiment or calculation, based on certain data. The length and diameter of the wire require to be different, according to the current required; for a short thick wire forming the helices represents a galvanic battery composed of a dozen, say, of very large pairs of plates, whilst a long thin wire would represent a battery composed of thousands of small plates. In other words, supposing the size of the helices to remain the same, if they are composed of thick short wires, quantity is obtained; but if composed of long thin wires, intensity will be the result.

From all this it results that there are certain laws known and established, by which a magneto-electric machine can be made to give a current of any given amount of electricity, with any given ratio between its quantity and intensity.

Having seen on what the production of the current depends, the next point to observe is, the peculiar nature of this induced current. It differs essentially from a galvanic current in this, that while the helices are revolving, the direction of the current is reversed, as the core of soft iron passes each consecutive pole of the steel magnets.

It now remains to explain how the current generated in the wires of the helices is to be withdrawn from the machine. In the first place all the helices are connected in two, or four, or more series, and in doing this great care must be observed that the direction of the coil of every alternate helix is in an opposite direction, that is, if one is wound as a right-hand screw, the next should be as a left-hand screw, or, what amounts to the same thing, supposing all wound in the same direction, then the two inner ends of the wires must be joined of, say, numbers one and two, and the two outer ends of the wires of number two and three, and so on through the series; and lastly, the terminals of the series might be soldered into two insulated discs, and then led from the machine by two pieces of metal kept in contact with the outer surfaces of these discs by a slight spring; such an arrangement allows the alternating current to pass from the machine, and such a current will produce a light, but this light has certain disadvantages. It is never white, but always more or less blue or brownish; in fact it is like the electric light obscured by placing it behind a flame from spirits of wine. It is also extremely injurious to the eyes, both from its colour and its tremulousness; I therefore do not use this current, but in its stead I convert this constantly-inverting current into two that flow from the machine in one direction only. This is accomplished thus: One half of the helices are arranged so as to arrive on the poles of the magnet at the instant that the other half are exactly midway between the poles. Thus there are two distinct currents; and what may be called the dead point, that is the point when the current inverts in one series, occurs exactly at the time when the other current is at its maximum, so that if now the inverted currents can be again inverted in both of these distinct currents, and that the two now flowing in one direction can be united as one compound current, it is evident that the result will be a current nearly as uniform as that from a galvanic battery, with the advantage of equable continuity. This is done by the two commutators, which consist each of two insulated rings of metal, of such a form at the periphery that two rollers or rubbers change sides from one disc to the other at the same instant that the current is reversed. Then, by combining the two commutators, a compound current is obtained that will produce a constant white light or perform any of the other functions of the galvanic current, and in a more perfect manner, as it is more uniform in its action.

A steady and constant current thus obtained from the magneto-electric machine is only one part of the problem of producing a constant and steady light, and, although the most important part, still it would be perfectly useless without an efficient lamp or regulator. In order to understand this it is necessary to explain that the carbon points used for producing the light or for converting a portion of the electric current into light, are consumed, and that the rate of consumption is irregular, owing to the irregularities in the structure of the substance used, which is the kind of graphite deposited in the gas retorts sawed up into pencils about a quarter of an inch square; but, as the consumption is irregular, no clockwork with continuous motion could be employed for the purpose of causing the carbons to approach as consumed, for it must be understood that the steadiness of the light as well as its brilliancy depend on the two carbon points being maintained constantly at a certain distance corresponding to the strength of the electric current.

Many pieces of apparatus more or less complicated have been invented from time to time for the purpose of regulating the movements of the carbon electrodes, and many of them I have tried, but none of them, as formerly constructed, could be used in a lighthouse, bcause they were more or less uncertain in their action, and because the clockwork was too delicate and liable to accident in other hands than those of an electrician. The question, what constitutes a good regulator, must be answered by stating what it must accomplish; and moreover it must perform its several functions in the most simple manner. It must in the first place maintain the carbons at a given distance, whatever be the variation in the state of consumption, and must also be capable of being adjusted to any strength of current; secondly, if by any accident the current should be interrupted, and the light thereby extinguished, the regulator should be capable of relighting at once with full brilliancy, that is, not only must it allow the carbon points to touch to re-establish the current, but must separate them again instantly, or there would be no light. Such a regulator we have here, for its construction is simple, and it forms its different functions in a most perfect manner. Its construction is this. The upper carbon is attached by a kind of small vice to a bracket, standing out from a tube, which slides freely in a column. The lower carbon is fixed in the end of another tube, exactly under the other carbon. Both of these tubes are put in motion thus: Two cords, passing over pulleys, properly arranged, are wound on one spindle, but in opposite directions. On turning a stud fixed on the end of the spindle the regulator is wound up; that is, the top bracket is raised, and the lower tube depressed. On removing the hand from the stud, the upper tube would descend, and, being loaded, would cause the lower tube to rise; but to prevent this, while the regulator is out of use a bolt is pushed in, which prevents any movement in the regulator till it is again withdrawn. The regulator being wound up, the carbons are firmly fixed in their places by tightening the holders, and are then adjusted so as to bring the points in the focal plane by turning a spindle to which the fixed end of the cord belonging to the lower carbon is attached. So far the regulator is only a means by which the carbons can mutually approach each other with a certain relative speed, depending on the different diameters of the two parts of the spindle around which the cords are wound. But if the carbon points remain in contact, there will be no light. Some contrivance, then, was necessary to separate the points to the distance, which, by experience, is found to give most light, and to maintain that distance between the points constantly till the whole of the pair of the carbons is consumed. These two operations are accomplished thus. The fixed end of the cord which works the upper carbon is attached to one end of a

lever; the other end of the lever has a piece of soft iron attached to it, over an electric magnet, so that when the bolt is withdrawn, and the carbon runs together until they touch (thus allowing the current to pass), this electro-magnet instantly, by the action of the same current, lifts the cord, and with it the upper carbon, to the required distance. But this is not all, for the carbons would again run together were there not some contrivance to prevent them. To accomplish this, advantage is taken of these two facts—first, that the quanity of electricity is proportional inversely to the distance between the carbon points; secondly, that the strength of an electro-magnet is proportional to the quantity of electricity passing through the wire that surrounds it. Bearing these two facts in mind, it will be easy to understand the use of the second electro-magnet. Over this electro-magnet, at a small distance above it, is placed a lever, one end of which is drawn down by a spring, the strength of which can be regulated by a thumb-screw. The fulcrum is between this end and the centre. The other end of the lever is furnished with a catch, and immediately over the electro-magnet a piece of soft iron is fixed in the lever. On the carbons being allowed to touch as before, not only are they separated by the means described, but this second lever, acted on by its electro-magnet at the same instant, is drawn down towards it, and thus brings the catch between the teeth of a wheel placed under it for the purpose, and effectually locks the regulator. The strength of the spring is now adjusted till its tendency to lift the catch out exactly balances the current which draws it down. Should the distance now increase but the $\frac{1}{200}$ of an inch, the spring will be stronger than the current, will lift the catch, and the carbons will approach; but by doing so more current passes, the electro-magnet is strengthened, and is again enabled to overcome the spring and draw down the catch, and thus by their mutual action the distance between the carbon points is all but invariable.

When these regulators are employed in a lighthouse there are a pair for each lens and two small lenses, so that although it may take ten minutes to replace the consumed carbons, still the light is never extinguished; for, suppose the carbons consumed in the lens No. 1, the regulator is ready in lens No. 2; and all the light-keeper has to do is to bolt the No. 1 regulator and draw the bolt of the regulator in No. 2 lens; the current is thus diverted, No. 2 is instantly lighted, and the lighting of this extinguishes No. 1.

Thus, then, we have a most intense light, which may be maintained for any length of time, which does not require to be trimmed or extinguished for a second, and which has all the steadiness and uniformity required for lighthouse purposes. Its advantages over the oil lamp are: first, its power can be increased *ad libitum* without increasing the size of the lens, for, if required, a machine may be made to give light enough to read by say at 10 or 20 miles; in fact the light is in direct proportion to the power of the machine that produces it; secondly, its great intensity gives it a power of penetrating haze only equalled by the sun; thirdly, its whiteness distinguishes it most perfectly from all other lights on shore, which is one of its most important properties, for many a vessel has been lost for want of this property in lighthouses lighted with oil; fourthly, where coloured lights are required for the purpose of distinguishing one lighthouse from another, this light gives all the colours in a perfect manner, while the oil lamp always gives its own tinge to the colour employed; fifthly, from the facility with which this light can be extinguished in an instant, and as instantly lighted to its full power, it offers other means of distinguishing lighthouse from lighthouse which cannot be obtained with any other light. The importance of this may be understood from the fact that there are still many points around our shores that require lighthouses, but which must remain without them, till better means of distinguishing them with certainty from others in the immediate neighbourhood can be employed; for having no lighthouse is hardly worse for the navigator than having two in sight which cannot be distinguished one from the other.

An objection has been made to this light, that, being so small, it would be altogether invisible at a considerable distance; and when we merely consider that the apparent size of distant objects depends on the visual angle, there seems to be some ground for the objection, but the law of visual angles does not apply in the case of self-luminous bodies, as can be demonstrated with this piece of fine wire, which I suppose is almost invisible even with a strong light thrown on it, but now, if by passing a current of electricity through it it is made self-luminous, it appears gradually to increase in diameter as it becomes brighter; and as a curious fact, illustrating the difference between the theorist in his study and the practical observer, a sailor who had seen the magneto light from a great distance told me he supposed it must be at least ten feet in diameter. Another objection to the light is, that it is too bright; this may be an inconvenience in clear weather, but a light to be useful when most needed must be inconveniently bright in clear weather.

The last point to be considered is the cost of the magneto electric light as compared with oil. The French director-general of lighthouses has made a report to his government, both as to first cost and as to cost of maintenance; both are greatly in favour of the magneto-electric light; of course in making their calculations of cost, they take the cost of an equal quantity of light in each case, that is, by oil and electricity.

I have now only to remark that this invention, if it may be called one, is purely English; Faraday commenced it when he discovered the fact that magnetism might be made to produce or induce an electric current; and although the magneto-light was first produced in Paris, it was by me; and so far from receiving assistance from any of the French *savans* in the matter, I was ridiculed by all of them for attempting what they said they could demonstrate was impossible. With regard to the regulator, which is also invented by me, there is another just invented by a Mons. Foucault, on a very different principle, but which is quite as effective though overloaded with clock-work. His regulator has this peculiarity, it can be used in a rolling vessel, and will bear with impunity the vibrations of a steamer.

DISCUSSION,

Mr. Lawrence suggested that Mr. Holmes should give a description of the practical arrangements of his apparatus at Dungeness lighthouse.

Mr. Holmes stated that at Dungeness, where the light had been in constant use since the 6th of June, 1862, there were in the lantern two small lenses, fixed one over the other, and two regulators to each. Only one light was shown at a time, but there were two regulators for each lens, so that an instantaneous change from one to the other could be made without extinguishing the light when fresh carbons were required. In the machine-room there were two magneto-machines, each capable of giving a powerful light, though both were in constant use. There was a distinct direct-acting steam-engine attached to each machine, and there were two Cornish boilers, each capable of generating steam enough for the two engines. The material consumed at Dungeness was about 30 to 35 lbs. of coke per hour, and $5\frac{1}{2}$ inches of graphite in the regulator per hour, the price of this last being under three farthings per inch. The principal item of expense was, at present, the engineer, who had charge of the whole apparatus, but he expected that when there were several lighthouses on this principle, it would be found that one engineer would be sufficient for as many as were at present under the charge of an agent, and that none but stokers and lightkeepers would be required on the spot. The magneto-electric machines which were at Dungeness contained 120 horseshoe magnets of about 50 lbs. each, and 160 helices, but those which he now constructed con-

tained only from 66 to 70 magnets, and from 88 to 120 helices.

The Chairman said he had listened with much pleasure to Mr. Holmes's very clear statement. He was glad to see present Dr. Gladstone, a member of the Lighthouse Commission, and he hoped that gentleman would favour the meeting with some remarks tending to illustrate this subject, which was one of national importance. It was most interesting to know that the little electric spark, not bigger than a pin's head, obtained by Faraday from the magnet not very many years ago, should have led to this development of power in the hands of an able and ingenious man like Mr. Holmes.

Mr. Summerlin referred to an invention of a somewhat similar character, by M. Berlioz, which, he believed, was superior to Mr. Holmes's apparatus. He would have been glad if Mr. Holmes had given some description of it.

Dr. Gladstone, F.R.S., said, as his name had been mentioned by the Chairman, he could not but rise to bear testimony to the able manner in which Mr. Holmes had brought forward this subject. During the existence of the Royal Commission, he had an opportunity of frequently witnessing the experiments made with this apparatus at the South Foreland. The Commissioners afterwards examined everything connected with the lighthouse system in France, where, at that time, when this brilliant light had been burning for half a year at the South Foreland, they were still making preliminary experiments, for they had not then overcome the irregularity of the current of electricity, and could not get a steady light. Since then they had advanced very rapidly, and orders had been given to place a double light of this description at Cape La Hève, near Rouen. The Dutch might perhaps be considered to have been before the French in the adoption of this system, and the Emperor of Brazil was probably before either. He did not think Mr. Holmes had exaggerated the power of this light, or the ease with which it was managed, and he was glad to be able to say this, because they knew that an inventor, justly proud of his child, was often unconsciously disposed to give the best possible account of it. He was very glad to hear what Mr. Holmes had said with reference to the expense of an engineer being divided amongst several lighthouses, because that was the main difficulty. When the complexity of an instrument was increased, more skill was required in its management, and this necessarily led to expense. The great desideratum was to have a light which was capable of penetrating to great distances in misty or rainy weather, and in that respect this light was far superior to the Fresnel lamp, which was quite competent to send a light to the extreme horizon on a clear night. In a dense fog no light whatever was of any use; but a mere mist, or a shower of rain, the electric light could penetrate. There was abundant testimony that the lights at Dungeness and the South Foreland had been seen by the captains of steamers crossing from Folkestone to Boulogne, at a far greater distance than an ordinary oil lamp. Moreover, the intensity of this light could be augmented to any extent. Professor Faraday, in his reports to the Trinity House, had laid great stress upon this. All that was necessary was to double the number of magnets, and practically this was easily done, because there were duplicates of everything in such lighthouses, and in foggy weather it was possible to bring the power of both machines to bear upon one instrument; and in that way double the intensity of light could be obtained. Then further,—supposing the fog to be so dense that no light could penetrate it, the steam engine on the premises might be employed to blow a horn or whistle, or to make some other noise which would serve as a direction to vessels. This had been pointed out by M. Regnault, director of lighthouses to the French Government, and was of great importance at a time when the question of fog signals was attracting so much attention.

Dr. Bachhoffner said, having been engaged in most of the patents taken out for producing the electric light, he had some little knowledge of the difficulties which had hitherto been considered almost insurmountable in producing the results which had been shown this evening. The great merit of this plan was the particular mode in which the electric light was obtained, and in this respect, as far as he had seen, Mr. Holmes had displayed a great amount of ingenuity. He confessed, when he first heard that Mr. Holmes had taken this matter in hand, he was very sceptical of his success; he did not believe that so much electric force could be obtained by the magneto-electric machine. The ingenuity displayed was very great, particularly in estimating the exact quantity of iron necessary for the core. Some years ago he (Dr. Bachhoffner) was engaged in some experiments on this subject, but he used iron wire instead of a hollow core. Mr. Holmes had spoken of the existence of liquid carbon between the two points, but this he (Dr. Bachhoffner) would be glad to have more evidence of. In using the electric light there was a deposit on one of the carbons, and with coke points pure graphite was produced, but he had great doubts as to the fact of liquid passing between the two points. A perfect automatic machine for regulating the position of the points was essential, and Mr. Holmes had mentioned that a spring formed part of this apparatus. He (Dr. Bachhoffner) was sorry there was any spring at all, or even clockwork. He thought a lamp might be constructed without a spring, and that would, in his opinion, make the machine perfect. The ingenuity displayed by Mr. Holmes up to this point would, no doubt, enable him to make an improvement in this respect. With regard to the question of cost, he did not think either the oxy-hydrogen light or the electric light would ever be useful for purposes of general illumination, for in such cases the cost of the light was a most important consideration, but for lighthouse purposes this ought not to be regarded, because the matter involved the safety of human life. Nevertheless, it would be interesting to know what was the cost of this system, light for light, as compared with other methods. He congratulated the public, the seafaring portion of it in particular, upon this valuable application of electric power, which at one time he thought hardly possible of accomplishment.

Mr. Holmes said the cost of this light compared with oil had been gone into by Mr. Regnault, director-general of lighthouses in France, and he had calculated very fairly on the principle of light for light, and, reckoning in this way, including the expenses of alteration, taking down the large lens and putting in two smaller ones, putting up the apparatus, two steam engines complete, and the buildings to contain them, the whole of the cost was calculated at half that of an ordinary first-class lighthouse, light for light. They would quite understand the actual expense was greater than in an ordinary lighthouse, but when the quantity of light was considered, it was less by one half, whilst the working expenses were only one-third. The light at Dungeness, he calculated, was equal in quantity to 14 of the large oil lamps with four concentric wicks. With regard to the intensity of the light, there was no form of combustion, and no chemical action which could produce a light—explosion was a different thing—beyond a certain amount of intensity. The greatest was that obtained upon lime, because the hydrogen and oxygen gases, burnt together, approached as nearly as possible to an explosion. With regard to the small size of this light, it might be argued that so small a light would become invisible at a great distance, say 30 or 40 miles. If an object three feet in diameter appeared to be only an inch at the distance of a mile, what must this little point of light be at a long distance? He admitted there was something in this argument when based on the theory of the visual angle only, but it did not apply to luminous bodies. [Mr. Holmes illustrated this by showing a thin wire, which was almost invisible till rendered incandescent by a current of electricity, when its apparent diameter was greatly increased.]

The Chairman said the next duty which devolved upon him was the agreeable one of proposing a vote of thanks to Mr. Holmes for his valuable paper. He was quite sure they had heard with satisfaction what had been stated by Dr. Gladstone, who had had opportunities of examining on a large scale the methods of illumination at present practised, and he was sure every remark from that gentleman would have great weight with those present. The power which this light possessed of penetrating to a great distance constituted its superiority to any system of lighting now in use; and it was to be borne in mind that that was dependent upon the extreme intensity of the heat evolved. It had been correctly stated by Mr. Holmes that of all the lights produced by chemical means, that of the combustion of hydrogen and oxygen gases upon a ball of lime was the most intense; but electricity was far more intense than any chemical action. By its means they could fuse the most refractory metals, and convert into vapour substances which could not be volatilised by other means. With regard to the precise condition of the carbon as it passed from point to point, there might be a difference of opinion. He thought it doubtful whether it was liquefied. He could corroborate the statement of Dr. Bachhoffner as to the complete conversion of the carbon into graphite when coke was employed. Mr. Holmes was greatly to be congratulated on the manner in which he had contrived to economise the power of his currents. He had by an ingenious method detected the means of indicating the exact quantity of magnetism residual in the magnet. Another curious result which Mr. Holmes's practical experience had enabled him to effect, was the proportioning the weight of the armature to the size of the steel magnet, so as to avoid diminishing its power. This was one of the most curious results in the science of magnetism that had been produced in the course of this enquiry. An opportunity had been presented to Mr. Holmes of making experiments on a grand scale, which could not be done in the laboratory of the chemist. The practical man followed the theorist, and hence there arose a harmonious co-operation between the two in the advancement of science. He congratulated the Society upon having had so valuable a paper brought before them.

The vote of thanks was then passed.

The paper was illustrated by a display of Mr. Holmes's arrangement of the electric light as used in lighthouses. Some reflectors and oil lamps were kindly lent by Mr. R. C. Wilkins, with the view of showing the various systems employed in lighthouses at different periods.

The Secretary announced that on Wednesday evening next, the 9th inst., a paper by Mr. John Chalmers Morton, entitled "Agricultural Progress: its Helps and its Hindrances," would be read. On this evening John Grey, Esq., of Dilston, will preside.

The following letter has been received:—

Sir,—In the discussion that took place on Mr. Holmes's valuable paper, Dr. Bachhoffner made a pertinent remark to the effect that while the magneto-electric arrangement for producing a continuous current of electricity was perfect, the lamp or automatic regulator was too delicate an instrument to place in the hands of such a workman as one might expect to find in a lighthouse, and that anything in the shape of a spring was to be avoided if it were possible. Now, although a cheap lamp is not a consideration for such an important object, a regulator of simple construction is much to be desired; for if a break-down were to occur during stormy weather, the ease with which repair can be effected would be a matter of the first importance. Now, the simplest form of electric light with which we are at present acquainted is that of Professor Way, for it mainly consists of a fine stream of fluid mercury flowing from an iron reservoir in connection with one pole of any arrangement that will give forth a current of electricity in one direction, such as we have in a Grove's or Bunsen's battery, or in Mr. Holmes's magneto-electric generator, into an iron reservoir in connection with the other pole of the arrangement, and at a certain point in the falling continuous stream of mercury, combustion of that very volatilizable metal occurs with the production of a very intense and peculiar blue light, which, from its characteristic aspect, is admirably adapted for signal or lighthouse purposes. Now, Dr. Gladstone informs me that the drawbacks to this arrangement are, that a small portion of mercurial vapour is *supposed* to escape from under the glass shade with which the light is protected, and that if a break in the fluid or current were to occur, the shade would become chilled (from the loss of heat on the cessation of the current) and the mercury be deposited in small globules, so as to veil the light for some minutes after the current and light were again established; for, when the shade is warm, the mercury flows freely down the sides of the shade, leaving the glass itself quite bright. I think a very little ingenuity would dispose of these faults in an arrangement that in other respects strongly recommends itself to consideration. If there are other faults, it would be as well that we should hear of them. But, besides this, there is another simple form of automatic lamp, furnished with the ordinary carbon points, the invention of my friend Dr. Squires, which is at once cheap and so free from complication, that it would be very difficult to put it out of gear. This was exhibited by me at the Polytechnic Institution at the trial of electric lamps, some time ago, and this roughly-made arrangement, costing scarcely two pounds for material and construction, held its own against the costly and complicated arrangements of Duboscq, Serrin, Ladd, Heisch, &c., inventions, by the way, admirably adapted for the niceties of the lecture-room demonstrating lantern. Thinking it right to let Dr. Bachhoffner and others interested in this important subject know that such a lamp as he indicates is in existence, I am, &c., SAMUEL HIGHLEY.

18, Green-street, Leicester-square, London, W.C.

Proceedings of Institutions.

Banbury Mechanics' Institute.—The distribution of the certificates awarded by the Society of Arts took place on the 23rd of October, in the Town Hall. The Rev. H. Back, vicar of Banbury, took the chair. —The Chairman said he regretted there did not appear to be any great increase in the number of the students. There was no reason why such should not be the case, for though no doubt the examinations were strict, still most intelligent young men would be glad to continue their education themselves after they had entered upon the details of active business, and would rejoice in being able to satisfy both themselves and the examiners that they had really been able to do so.—Mr. Beale having read the list of successful candidates, Mr. Pidgeon addressed the meeting. He thought the results of the examinations were very satisfactory, and proved that the connection of the Mechanics' Institute with the Society of Arts had done considerable good to the education of the young men of Banbury. He took the opportunity of explaining the distinction between the Government Department of Science and Art and the Society of Arts, which were often confounded.—Mr. Samuelson, in proposing a vote of thanks to the Local Board, said that thanks were due in the first place to the Society of Arts itself, and to the founders of the system of examinations—a system which had since been followed up by the Oxford Middle Class Examinations, and still more recently by those of the Government De-

partment of Science and Art at South Kensington. This was seconded by Mr. Brooks, and acknowledged by Mr. Beale. A musical performance was afterwards given.

Barnet Institute.—The fourteenth annual report says that, perhaps, on no former occasion, has there been greater cause for congratulation upon the success of the Institute. The Committee are happy to state that more general interest in the welfare of the society is manifested throughout the whole neighbourhood. The number of members upon the books is 190, being an increase of 50 added during the past season. The attendance upon the lectures last winter was considerably over the usual average. The library has received some valuable additions this year, and will be further improved shortly, as there is money voted for books which has not yet been expended. The Committee regret that more use is not made of the privilege of the Society of Arts Examinations. Three candidates only presented themselves this year. The Committee have done much in the formation of classes; but they have not been well supported. The funds are sufficient for present emergencies. The receipts were £101 4s. 2d., and there is a balance in hand of £19 2s. 4d.

Worcestershire Union of Educational Institutes.—The annual meeting of this body was held at Stroud on the 20th November, in compliance with an arrangement made last year, Gloucestershire having now joined in the Union. J. S. Pakington, Esq., President, was in the chair. The Rev. W. Walters, Hon. Sec., read the sixth annual report, which expressed the satisfaction of the Committee at the extension of the Union into Gloucestershire, and alluded to the vacancies in the committee, occasioned by death and removals. The Committee also recommended that in future there should be but one Hon. Sec., with a paid subordinate. The following shows the progress of the Union:—

	Institutes having Classes and Night Schools.	Pupils in Classes.
1858	8	342
1859	9	293
1860	10	697
1861	14	851
1862	20	1,457
1863	28	1,418

The report of the organizing master for 1863 showed the number of candidates to be steadily on the increase. This year it is 356, exceeding that of last year by 143. But he adds that, generally speaking, evening classes are not in a satisfactory state, and are not doing the good they are calculated to effect. Penny Readings had been established at Redditch with success. The book boxes had been steadily circulating, and the experiment of holding a meeting for the reading of papers on educational subjects had been successful. The report alluded to the establishment of the Metropolitan Association for Promoting the Education of Adults, and cordially wished it success. Under the auspices of the "Club and Institute Union" twelve new Institutes and Working Men's Clubs had been established in various parts of the kingdom during the past year. The finances of the Union are still too low to allow of anything but the most gradual progress. The statement of accounts shows the expenditure of the year to have been £76 9s. 5d., and that there is a balance against the treasurer of £4 1s. 6d. On the question of entertainments being introduced, Rev. H. Solly (Secretary of the Working Men's Club and Institute Union) spoke in favour of mixed reading and music, and theatrical entertainments, but said that the last-named were likely to lead them into legal difficulties. He urged that the great advantage of Saturday evening entertainments lay in the fact that they afforded the means of bringing the working classes, and among them the most well-to-do and respectable artizans, under many very beneficial influences, from which they had hitherto been almost entirely debarred. Mr. H. New (Evesham) read a paper on the engagement of a paid teacher, instead of a lecturer, by the Union. They had not, he said, at present, any system which made their classes of a permanent character. In looking at the report of the Yorkshire and East Lancashire Unions, he found that the former had an agent who went round visiting the Institutes, but in the East Lancashire Union he found something more strictly educational—that two skilled itinerant teachers went round and taught the local teachers to set the schools going. These masters visited Institutes five days a week, and lectured on the Saturday. Lectures were not the most important part of the scheme of an educational institute. If they wanted to find real education they must go into the class rooms and reading rooms.—The usual dinner was held in the Masonic Hall, some 250 people being present, S. S. Dickinson, Esq., President of the Stroud Institute, in the chair.—An evening meeting was held at which Earl Ducie presided. Sir John S. Pakington, Bart., delivered an address, in the course of which he deprecated the making recreation a primary object of an Institution, being of opinion that youth would find means of recreation; he also spoke against applying the word "club" to an Institution that had for its object the mental and moral improvement of the people, and in reference to the progress of education said that the other nations of Europe were ahead of us in educational appliances. In many of those countries the cultivation of the intellect of the working classes was better, more skilfully, and more successfully attended to than in our own country, and this was also the case in our colonies. Mr. J. S. Pakington, in proposing a vote of thanks to the Chairman, &c., said the meeting that day was the most successful that had taken place in connection with the Institution.

SCIENCE AND WAR.

The Duke of Cambridge and the Secretary of State have issued some important educational regulations which are well calculated to augment the connection of science with warfare, and to give an increased impulse to the improvement of our artillery corps, which ought to be equally as scientific as the Royal Engineers,. The early training of both corps is the same, and it might perhaps be well if they were amalgamated, so as to have the pick of the best men for those services in which they most distinguish themselves. 1. Provision is made for the future special instruction of officers who may desire to qualify themselves for employment in connection with the manufacturing departments, the civil establishments of the Royal Military Academy, and generally for all appointments usually held by officers, not being military staff appointments, which are special to the Artillery service. 2. By this arrangement the Royal Regiment of Artillery will continue to sustain its scientfic reputation under any progress which may be made in the mechanical arts as applied to *matériel* of war. 3. No officer will be permitted to compete for a place in the proposed class who has not given satisfaction in the discharge of his regimental duties, and is not, from a military point of view, an active and efficient artillery officer. 4. No officer will be admissible under six years' service, and he must have undergone a course of instruction at Shoeburyness. A medical certificate of good health will be required. 5. The first examination will take place in March, 1864, under the Council of Military Education. The books to be specially taken up, until further notice, are—*Twisden's Mechanics* and *Todhunter's Differential Calculus*, but the examination will be chiefly confined to the earlier portions of the latter. The French will be qualifying for the purpose of ascertaining that the candidate has such an acquaintance with the language, and especially with the technical terms in common use, to be able to consult professional works, such as Didion's *Traité d'Artillerie*, or the *Aide-Mémoire d'Artillerie*, with facility. 6. The relative importance to be attached to the subjects of examination will be as follows:—Differential and integral calculus, 700 marks; chymistry, physics, 300 marks;

French, qualifying. 7. The course of instruction will extend over two years, and embrace in succession the special duties of each manufacturing department. For example, in the Royal gun factories, metallurgy of copper, tin, zinc, and their compounds; mechanical and chymical properties of gun metal; metallurgy of iron, including cast-iron and wrought iron, steel, and their alloys; mechanical and chymical properties; principles of construction of cast-iron guns; principles of construction of built-up guns, welding, &c.; the steam hammer; turning, boring, rifling, and sighting guns; all the machines, lathes, special tools, and processes; comparison of systems of rifling and breech-loading for cannons; gauges and micrometrical measurements; organisation of labour in the Royal gun factories; system of account-keeping, pricing, and payment in the Royal gun factories; relations to the director of stores, director of contracts, principal superintendent of stores and director of ordnance; patterns, systems respecting them; examination of stores. 8. Duties of the Inspector of Artillery:—Proof of guns, examination of guns and stores. 9. The small arms departments, Enfield and Pimlico, will follow the Royal gun factories, and be treated in the same comprehensive manner, including the system of supply of small arms to the army, their repair, and comparison of systems of rifling and breech-loading for small arms. 10. From the Royal gun factories the class will proceed to the Royal carriage department, where the subjects will be,—selection and purchase of timber, seasoning of timber, saw-mills, planing and other machinery applied to working of timber; construction; mechanical principles as applied in military machines; friction, draught, traction, locomotive power; harness; organization of labour in the Royal carriage department; system of accountability and payment; prices; relations to director of stores, director of contracts, principal superintendent of stores, and director of ordnance; patterns, systems respecting them; examination of stores. 11. Here will conveniently come in the organisation and duties of the department of the Principal Superintendent of Stores, including the detail of equipments for all services; and proportions of stores, packing ammunition, arrangement of magazines. 12. The last term will be devoted to the manufacture of gunpowder, ammunition, and, generally, the duties of the Royal laboratory, including the chymistry of the subjects—selection and purchase of pyrotechnic material; examination and refining of saltpetre, &c.; gunpowder and powder-mills; theory of gunpowder, qualities, effect of different sized grains; electro-ballistic apparatus, and other modes of proof, gun cotton, detonating compounds, other laboratory specimens, small arm ammunition, cannon ammunition, fuses, rockets, &c.; manufacture of bullets, casting of every description of projectile for smooth bored and rifled ordnance; organisation of the Royal laboratory department; supply of raw material; system of account keeping and payment, prices; relations to the director of stores, director of contracts, principal superintendent of stores, and director of ordnance; patterns, inspection, and examination of stores. 13. The Professor of Applied Mathematics and the several lecturers will proceed in corresponding order through their subjects, so that practical instruction may be based on thorough acquaintance with principles. If found necessary to do so, a large part of the first term will be devoted to theoretical instruction and mathematics, in order that the students may be in a position to follow the professor in the more advanced subjects of his subsequent lectures. 14. There will be periodical examinations and certificates given at the close. 15. No payment will be required. 16. After a certain date, to be fixed hereafter by the Field-Marshal Commanding-in-Chief, first appointments to all special employments of a scientific character will be made exclusively from officers who have passed through the contemplated course of instruction.

THE PAPAW TREE.

At a meeting of the Acclimatisation Society of New South Wales, held in Sydney in August last, Dr Bennett read a paper on the papa or papaw tree (*Carica papaya*), from which the following are extracts:—Visitors to the Sydney Botanic Gardens may have noticed a handsome tree, full six feet high, with large fig-like foliage, on long footstalks, and a melon-like fruit growing from the stem—this is the female tree of the papaya or papaw tree, as to which, for some time, botanists were divided in opinion into what order of the vegetable kingdom it ought to be introduced. By Linnæus it was placed among the *Euphorbiaceæ*, or spurgeworts; by the younger Richard, among the *Passifloræ*, or passionworts; but it now forms the order *Papayaceæ*, and Lindley regards Jussieu's opinion to be correct in considering that the genus upon which this order was founded held a sort of middle station between the nettleworts and cucurbits.

At another part of the garden, at some distance from the female papaw tree, in a soil and situation the most suitable for its successful growth, may be seen a fine healthy male specimen of the same tree (for the papaw tree is generally diœcious—that is, having male and female flowers on separate trees); it is distinguishable from the other by having racemes or panicles of tubular flowers, which spring from the axils of the leaves, and are small, bell-shaped, of a pale yellow colour, and of an agreeable fragrant smell. The flowers of the female tree have very short foot stalks close to the stem; they are large and bell-shaped, and of a yellow colour. On these perishing the large fleshy fruit is gradually developed. Both these trees have been recently introduced into New South Wales, where they may now be considered naturalised. The fruit is smooth, rather oval, but varies in form, and is about the size of a small melon, resembling the latter fruit in colour when ripe. The central cavity is filled with small, oval, dark-gray seeds, enveloped in a kind of mucus, and which, when chewed, have the pungency and flavour of the Indian cress. The ripe fruit is esteemed by some persons; and the green fruit well boiled, mashed, and sweetened with sugar, and flavoured with lemon-juice, is often used as a substitute for apples in sauce and tarts.

It has been a matter of difficulty to determine the native country of the papaw—both the West and East Indies claim it—there is, however, no doubt of its being indigenous to tropical America, if only from the circumstance of several distinct species inhabiting that continent, while only the cultivated kind is found in the East Indies and Africa. It has been introduced into all tropical countries, and is now even found growing among many of the Polynesian islands. It grows to the height of from fifteen to twenty feet, with a slender, soft, herbaceous stem of small circumference, surmounted by large light leaves, which are supported upon hollow foot stalks, full three feet in length. The bark is rather smooth, pale grey, and has the mark of the fallen leaves. The stem is usually straight, but the female tree in the Sydney Botanic Gardens has two stems growing from one root. It is a tree of rapid growth, and is readily propagated by seeds and cuttings. The tree in the Gardens now bearing fruit is about fifteen months old. The peculiarities of this tree are so remarkable as to merit some notice. The whole of it yields a slightly acrid milky juice, and all parts of the tree are considered efficacious as an external application for the cure of ringworm. The milky juice of the unripe fruit has been found to be a powerful and efficient vermifuge, and the powered seeds have also been recommended for the same purpose, and considered tqually efficacious—a single dose is generally considered o cure, however numerous the worms may be.

Fibrine was considered peculiar to the animal kingdom and the fungus tribe, but it is found that the milky juice of this tree contains it in such quantities as to

resemble animal matter, and was found by Sir H. Davy to abound in albumen; indeed, the resemblance between the juice of the papaw and animal matter was so close as to be suspected as an imposition, if the evidence of its being the juice of a tree had not been quite unquestionable. Water impregnated with the milky juice makes meat washed with it tender, when steeped for only ten or twelve minutes; and the same effect is produced when meat is suspended among the foliage of the tree. It is also mentioned that old animals, when fed upon the uncooked leaves and fruit, become tender and good if eaten soon after they are killed, for the flesh soon becomes putrid. According to the analysis of Vauquelin of the milky juice, 'It most resembles animal albumen, dissolving like it in water. Its solution is coagulated by heat, by acids, alkalies, the metallic salts, and infusion of nut galls; and by distillation, it yields the same products as animal substances.' Vauquelin also says that a sample of the juice he examined had the smell and taste of boiled beef. Dr. Holder (in the third volume of the 'Wernerian Transactions,' pp. 245–50), who observed the peculiar properties of the juice of this tree in the island of Barbados, says that the effects of the juice, whether of the fruit, stem, or leaves, or even the exhalation from the tree lessens the cohesion of the muscular fibre, and acts on the fibrin of the blood. When the fruit is boiled or cooked in any way, or when ripe, it does not produce the same effect; therefore heat evidently dissipates the active principle on which the intenerating action depends. It is also a common practice in Barbados to administer an infusion of the raw fruit, or rather a diffusion of the milky juice in water for horses, with a view, as it is said, of 'breaking down the blood,' and it is a fact well established, that if given to a horse whose blood exhibits the cupped buffy coat, it will, after some time, produce a loose coagulum, and reduce the inflammatory symptoms which gave rise to it. All the facts produced clearly show that the fruit of the papaw when eaten uncooked evidently acts injuriously on the muscular fibre of animals, for instances have been mentioned of animals that have eaten of the fruit in that state whose flesh has become so much intenerated as to be unpleasant to those who partook of it. The leaves of the papaw are used by the negroes in the West Indies to wash linen instead of soap, and the juice of the pulp as a cosmetic to remove freckles on the skin caused by the heat of the sun.

LIFE-BOATS FOR THE NAVY.

The Admiralty, anxious to provide all cruisers with small life-boats, has asked the officers of the National Life-boat Institution to give plans and superintend the building of a life-boat suitable for a man-of-war, but not to exceed one ton in weight. A trial was made lately with two such boats in the Regent's Canal Docks, in the presence of the Lords of the Admiralty and others. The *Times* gives the following account of the experiment.—One of the two boats tried was 32 ft. long by 8 ft. 10½ in. extreme width, capable of holding, on an emergency, as many as 70 persons, and of accommodating with ease 45 or 50. This boat, however, weighed 37 cwt., or very nearly double what is considered should be the maximum for a handy and useful boat for sudden emergencies. The second boat was 30 feet long, by 7 ft. 4½ in. wide, and weighed only 22 cwt. This would stow with ease 30 persons, and could take off 50 at a pinch. It seemed evident, however, that the Admiralty, in fixing the maximum weight at one ton, have adopted a standard which it will be found very difficult to comply with so as to make a really efficient craft for all weathers. The boats were canted over to the water's edge in every way, and the largest, when emptied, was turned over by means of an hydraulic crane, and though in the still waters of the docks it did not actually right itself, it remained on its side sufficiently buoyant to enable the men to turn it on its keel easily. In dense sea water, and especially in sea water with any swell in it, there is very little doubt it would have righted of itself almost immediately. When it did right, the relief pipes in the bottom, which were opened, allowed the whole load of water in it to run off in less than half a minute. The small boat, though not tested with this severity, was sufficiently proved to show that even when heavily laden with sailors, and the relief pipes and the boat awash to the gunwales, it was still as buoyant and as seaworthy as ever. The result of the trials seemed to show that if the Admiralty will only allow a slight addition to their present standard—say from 20 to 25 cwt.—a perfectly efficient life-boat, fit for any duty in any weather, may easily be obtained. After the trial with the Admiralty boats, one of the Institution's life-boats was shown. This the hydraulic crane had the greatest difficulty in turning over, and no sooner was it brought keel uppermost than it righted itself again, and freed itself of water in the space of 20 seconds. After the trials, the Duke of Somerset expressed his thanks to Mr. Chapman and Captain Ward for the care which they had bestowed in perfecting the boats which were tried.

LUCIFER MATCHES.

Experimental inquiries involving the chemical examination of a considerable number of matches of different kinds, manufactured in London, the Provinces, Germany, and Sweden, have been made by Mr. F. A. Abel, of the Laboratory at the Arsenal at Woolwich, and the result has been given in a paper published in the *Philosophical Magazine* for November. Thirty-five different kinds of matches were examined; these included, besides ordinary lucifer or Congreve matches, varieties of wax or Vesta matches, of cigar lights (fusees, Vesuvians, &c.), and of so-called "safety matches." By far the larger portion of matches are still prepared with ordinary phosphorus; sulphide of antimony and powdered glass are very general additional constituents of the igniting composition. The matches of several extensive English manufacturers were found to be prepared with an igniting composition containing both ordinary and amorphous phosphorus, the latter being employed in some instances in considerable quantity. Golden sulphide of antimony and powdered glass were found in all the igniting compositions of this class, and a small proportion of free sulphur was contained in several of them. The Congreve and Vesta matches of English manufacture, which are tipped with compositions containing no phosphorus whatever, are unquestionably great improvements upon the earlier continental matches. They are inflamed with ease and certainty when pressed over the amorphous phosphorus rubber on the box; and the latter does not rapidly deteriorate from the effects of atmospheric moisture upon it, as was formerly the case.

Differences exist between the temperatures at which the igniting material of different matches will inflame spontaneously, and in the degree of facility with which they are ignited by friction and percussion. The order of sensitiveness to ignition by friction or percussion of a match was found to correspond with its susceptibility to ignition by heat alone, in the case of those which contained ordinary phosphorus and chlorate of potassa, provided that glass was included in the composition of the igniting material. Where this was not the case, the matches, though they might be more sensitive to the effects of heat alone than others, on account of the predominance of phosphorus in them, were considerably less so to the effects of friction or percussion. The results of experimental observations prove conclusively that no degree of heat to which, under all ordinary circumstances, matches are likely to be exposed in their transport or otherwise, would suffice to lead to their spontaneous ignition. Even a temperature such as can be attained only under exceptionable conditions by the atmosphere in the hold of a vessel, would not, unaided, bring about the ig-

nition of the more sensitive matches. The effect, however, of even a very moderate degree of heat in facilitating the ignition, by friction or percussion, of mixtures such as those with which the tips of the matches are prepared, is well known. If a box full of lucifer matches, in which the matches, as is very generally the case, are not sufficiently long to fill the box entirely, be subject to repeated concussion, in such a way that the heads of the matches strike repeatedly with some violence against one end of the box, a proportion of the matches will eventually inflame; but the composition upon the head of the match only burns, and the flame generally does not even spread from the head of the match ignited to those immediately surrounding it; so that only isolated matches will be inflamed in a box full with all the heads placed in one direction. If, however, a box of the same matches be exposed to a heated atmosphere (from 27° to 37° C.) sufficiently long for the matches to become warm throughout, the extent to which it will be necessary to submit them to concussion before ignition occurs will be comparatively very slight, and in all probability the whole of the matches in the box will become inflamed almost instantaneously. In common match boxes, with which this experiment has been tried, and which did not close at at all tightly, the wood of the matches was partially burned, and the box itself caught fire at the edges. It is, therefore, within the range of possibility that in the transport of matches on board ship, and in the absence of due precautionary measures, continuous concussion, combined with a degree of heat not unfrequent in the hold of a vessel, may bring about the accidental ignition of lucifer matches—an occurrence which is known to have taken place, and which, it is believed, is much more frequently the cause of fires on board ships than manufacturers and exporters of matches may be disposed to admit.

The author recommends the following precautionary measures with a view to reduce to a minimum the possibility of accidental ignition:—1. The special appropriation, if possible, of some part of the vessel in which matches are transported, to the reception of the packages containing them—or, at any rate, the stowage of such packages together (as far as practicable), distinct from other merchandise of a combustible nature, and in such positions that they may be readily removed in the event of any accidental ignition occurring. 2. The efficient ventilation of that part of a vessel in which matches are stowed. 3. The enforcement of rules on board ship to prevent the possibility of fire being brought by sailors or others into the vicinity of packages of matches. 4. The careful packing of match-boxes into cases, so as to prevent their being subjected to any independent motion by the movement of the vessel. 5. The bestowal of a more uniform attention upon the production of safe and sufficiently stable match-boxes. The metal boxes with hinge lids, in which Vesta matches are most generally packed, rank highest as regards the security they afford to the match, and the circumstance that no accident, however slight, is on record as having attended the shipment of Vesta matches, may stand in close connexion with the employment of such boxes with these particular matches. There are several other kinds of boxes used by manufacturers which are calculated to afford security to the matches, or rather which would do so if their length or height were properly proportioned to the length of the matches. In the majority of instances, however, they are longer or higher than the matches, and sometimes very considerably so; hence, if the latter are not most firmly wedged into the boxes, the construction of these is positively calculated to afford opportunity for submission of the match-heads to concussion. The slide-boxes containing the Swedish matches, which are now largely imported, are all made to correspond in length with the matches they contain. A very extensive importer of these matches states that he had never known of a single instance of accidental ignition occurring in their transport. Many of the boxes roughly constructed of thin chip, which contain the commoner descriptions of English congreves, not only afford but little protection to their contents, but may actually be in many instances sources of danger. Unless boxes of this kind are packed with the greatest possible care, some proportion is almost certain to sustain injury, resulting in the immediate escape of matches from the box. In some instances a piece of well-made glass or emery-paper is pasted on to the bottom of the box, or some fine emery or glass-powder is securely fixed to one of its surfaces by means of glue and coatings of varnish; but in many instances either glass or emery-paper of very inferior quality is used, or the frictional powder is very loosely and carelessly attached to the box by being merely dusted over one of its surfaces, upon which a small quantity of glue has first been applied. In packing match-boxes of this kind, much of the frictional powder will become detached, and further quantities will speedily be rubbed off and be loose in the cases if there is the slightest play for movement of the boxes during transport. The hard angular particles will speedily insinuate themselves into the boxes and between the matches, and contribute their share towards augmenting the possibility of accident.

These remarks do not in any way refer to the matches which are ignited only by being passed over a surface of their box, which is coated with a preparation of amorphous phosphorus. The compositions with which the matches of this class are tipped require very powerful friction or percussion for their ignition, and are, of course, inflamed at temperatures far above that required to ignite the least sensitive of the matches prepared with phosphorus. The possibility of their accidental ignition must therefore be, to say the least, extremely remote. As to the various cigar lights now sold, the author is of opinion that very great risk must be incurred in their transport, and that it is impossible to adopt any precautionary measures which can warrant their shipment with any confidence in the safety of the vessel.

Fine Arts.

Art-Workmen.—A "Quondam R.A. student" writes:—The Commissioners appointed to report upon the Royal Academy proposed that a class of art-workmen should be connected with the Academy, and that those who showed great excellence should receive honorary distinctions, and become members of the Academy. This recommendation Mr. Hawes, the Chairman of Council, in his address to our Society, specially notices as providing a most valuable addition to the art education of workmen. I have too much respect for the judgment of Mr. Hawes not to dissent from this opinion with great reluctance, but his address will give such large circulation to the proposal, and at the same time have such weight with our clever artisans, that he will not object, I am sure, to the expression of a different view of the question:—1st. The schools of the Royal Academy are as unsuited for the proper education of art-workmen as the members of the Academy are to be teachers of the special branches of decorative art appropriate to manufacture, the education of the artist and of the art-workman proceeding on principles entirely distinct. 2nd. There can be no claim whatever upon the members of the Academy, who are the gratuitous teachers of the Fine Arts, to become the teachers of decorative art, even if they are qualified and possess the means for such teaching; but their schools have nevertheless been always wide open to every art-workman who chooses to avail himself of their course of study and has attained the amount of proficiency in drawing required of all who seek to enter them. 3rd. While the Royal Academy is unsuited to the teaching of art-workmen, and is located in the metropolis, where the great branches of manufacture in which skilled artisans are largely employed are not carried on, we have a state institution created specially for their instruction, with a great central school, and branch schools, both in the metropolis and the great

seats of manufacture, with masters trained to give the greatest development to the workman's taste and skill—collections of the finest and most costly examples made for his use, and encouragement held out to him by prizes and scholarships to such an extent that for no less than fifteen of the latter offered last year, of the value of £1 per week for one year, with free instruction for that time, there were only four competitors, three of whom alone were selected as barely possessing the rudimental attainments necessary to fit them for the course of study opened to them. Is it not idle, then, to supplement such teaching and such inducements by the crude proposal made in the report of the Commissioners? It seems, indeed, that our own busy Society, by its well devised scheme of prizes to art-workmen, judiciously selecting those works which are calculated to try their powers and test their skill, is doing more for their real improvement and welfare than the jejune scheme of the Commission with its illusory, ill-suited honours.

BURSLEM INSTITUTE.—The award of Mr. Beresford Hope and Mr. Digby Wyatt, as judges of the competition designs "for the decoration of the façade of the Wedgewood Institute in any kind of ceramic ware, coloured bricks, mosaics, and terra cotta," has been made. The first prize of £25, given by Mr. Hope, has been awarded to Mr. R. Edgar, architect, jointly with Mr. J. Kipling, modeller, both of whom were students of the Art Schools in the Potteries. Mr. Edgar is now one of Mr. Gilbert Scott's assistants, and Mr. Kipling is assisting Mr. Godfrey Sykes in the decorative works executing for the South Kensington Museum. Mr. Deville, of London, received the second prize of £15, given by Mr. Heathcote; Mr. J. Ladds, of London, the third prize of £10, given by Mr. Edge, and the fourth, £5, given by the Rev. Dr. Armstrong, was awarded to Mr. E. Power, of London. Mr. Beresford Hope has reason to be contented with this experiment, which he was the first to suggest and promote with his purse and labour.

GREAT DOOR AT THE CAPITOL IN WASHINGTON.—This is stated to be a fine work of art, and stands at the entrance of the corridor leading from the old hall of the house to the new. The door is of bronze. The design was by Mr. Randolph Rogers, an American artist working at Rome. The founder was Mr. Frederic Von Muller, of Munich, Bavaria. It is said to be the only work of the kind in the world. Its weight is 20,000lb., and when completed the expense will be about 30,000 dollars. The leading subject of its embellishments is the history of Columbus. It has two valves, with four panels on each valve, and one semicircular panel over the transom. The first panel contains a scene representing Columbus before the council of Salamanca; the second his leaving the convent of La Robida; the third his audience with Ferdinand and Isabella; the fourth his departure from Palos; the semi-circular panel over the transom represents his first landing at San Salvador; the fifth his first encounter with the Indians at Hispaniola; the sixth his triumphant entry into Barcelona; the seventh represents him a prisoner in chains, about to be sent back to Spain; the eighth contains a scene representing his death. There are 16 small niches in the border or frame around the door, in which are statuettes, representing distinguished contemporaries of Columbus, and between the panels are heads representing historians who have written on his voyages from his own time down to the present day, ending with Irving and Prescott. Crowning the door is a bust of Columbus. The ornaments are chiefly emblematic of conquest and navigation. There are also about the edge four statuettes, representing the four great divisions of the world.

Manufactures.

RESTORATION OF ANIMAL CHARCOAL.—In a beetroot sugar factory at Francières (Oise), a new process, invented by Messrs. Leplay and Cuisinier, is adopted, by which the properties of the animal charcoal are readily restored without having recourse to emptying it from the filters and reburning it. It is stated that at Francières the charcoal has not been taken out of the filters for several weeks, and has each day undergone the process of restoration at a most trifling expense, and with perfect success.

RIFLED GUNS.—A preliminary trial of Sir William Armstrong's 600-pounder gun, lately manufactured at Elswick for the War Department, was made on the 19th November, at Shoeburyness. The gun weighs over twenty-two tons, and is mounted on an ordinary gun carriage of great size and strength. Its length over all is 15ft., that of the bore being 12ft. Its internal diameter is 13·3 in., and it is rifled on the "shunting" principle. The grooves are ten in number, and turn once in sixty-five calibres. In its construction it differs but little from the other large muzzle-loading guns manufactured under Sir William Armstrong's direction, consisting of a number of coiled tubes of enormous strength shrunk one upon the other. The thickness of the walls of the gun at the breech is 20·85 inches, the total diameter at the trunnions being 55 inches. It carries a conical cast-iron hollow-headed shot, weighing 510 lb., or a shell of ordinary construction weighing 600 lb., and capable of containing a bursting charge of 40 lb. of powder. The charge used with shot was 70 lb.—with shell 60 lb. The gun was served by a party of twenty men. A 9-inch muzzle-loading gun, made at the Royal Gun Factories, Woolwich, and rifled on the plan proposed by Mr. Lynall Thomas, was tried on the 20th November. This gun, which carries a 300 lb. shot, closely resembles an ordinary muzzle-loading Armstrong in outward appearance, the muzzle, however, being more prolonged. Mr. Thomas's invention consists in substituting a series of ribs for the usual grooves. The shot are made with grooves coated with soft alloy to fit the ribs of the gun, and are similar in form to those used in the Armstrong, but appear to be slightly longer. The "shunt" principle is not employed by Mr. Thomas. To test the range and accuracy of the gun, ten rounds of cast-iron shot were fired from it at 2° elevation, ten at 5°, and ten at 10°, the charge being 40 lb. in every instance. The velocity and range of the shots fired appear to have been very unequal.

Commerce.

STEEL SHIPS.—Two large ships, built of steel plates, were recently launched in the Mersey. Though some small vessels have been built of the same material, this is the first instance in which steel has been used for ocean ships. The steel now manufactured for shipbuilding purposes is said to have an advantage over iron in being more ductile and malleable, as well as stronger and lighter. These qualities bring with them, it is also said, greater economy in building and increased carrying capacity—both most important considerations. Mr. Jones, one of the builders, states that in the *Formby*, one of the newly-launched vessels, of 1,276 tons burden, the weight of steel used is 500 tons, whereas, if she had been constructed of iron, 800 tons of that metal would have been required. In a vessel like the *Warrior*, he declared that by using steel greater strength might be obtained with a saving of one-half in the weight of metal. Mr. Reed, Constructor of the Navy, made a special journey from London to attend the launch and examine the ships. He remarked that merchant ships can be built to test a principle when war ships cannot, as the former can be examined and repaired annually, while the latter are sent abroad for periods of three or four years. He perfectly agreed with what had been said of the importance of steel for the construction of small ships, and stated that the Government took great interest in the question of employing steel as a material for shipbuilding.

British Trade with Japan.—The value of the export trade in British vessels has increased, during the half-year ending the 30th of June last, from £253,337, of the corresponding period last year, to £561,120, and yet, during those same six months, events of an alarming character occurred which were calculated to paralyse any trading operations whatever. The imports in the first six months of this year were £111,470, against £68,931 for the same period of last year, being an excess of £42,489. In this year's returns raw cotton figures for the first time as an article of export, to the extent of 795,207 lbs.

Wool.—The Circular of Messrs. A. C. Stewart and Co. of Port Elizabeth, Algoa Bay, dated October 11th, says:—"The arrivals of wool from the country districts have been comparatively light, consisting of small parcels of odd lots. We have again to complain of the 'seedy' and 'burry' character of much of the wool brought forward. Prices, on this account, have ruled lower than they would have done. The following are the present prices:—Fine fleece-washed wool, superior, 1s. 2½d. to 1s. 3½d. per lb.; medium, 1s. to 1s. 1½d.; inferior, seedy, and burry, 11d. to 12½d.; coarse, washed, 9d. to 10d.; fine, unwashed, superior, 8¼d. to 8¾d.; average, 7¾d. to 8¼d.; coarse, unwashed, 6d. to 7d. per lb. The exports during the past month have not been so large. The most remarkable feature in the freight market is, that nearly all the vessels on the berth have been chartered for America, and two more vessels have been chartered in Cape Town to come round and load here for America. The trade this year with our transatlantic cousins will show well when compared with that of previous years."

Supply of Cotton and Labour. — A "Cotton-Spinner," writing to the *Manchester Guardian*, says:—"I would just point out a few of the principal causes of this scarcity of labour, that its extent may be more easily appreciated. Emigration has taken out to our colonies and other places a considerable number. Many have obtained other employments, for instance—girls have gone into service, and, through the instruction sewing-schools have afforded, others have been enabled to accept situations as seamstresses, &c., from which pursuits it is very doubtful if many of them return. But there is another and a more serious point still than any of the preceding—I allude to the cessation of the ordinary labour supply. When mills are working, children are taken into them and employed, first as sweepers, bobbin carriers, &c., and thus they are being gradually trained to fill the places of those who, from a multitude of reasons, are constantly leaving the work. These are now arriving at the age of full timers; and, through the stoppage of mills, are every day growing up untrained and unskilled, whilst at the same time the causes that usually deplete factories have been going on amongst the old hands. So that, from all these causes together, I cannot help concluding that there will be a very great deficiency of hands when the time comes for resuming work; and, after deliberate consideration, I believe that, could we only have a supply of 35,000 to 40,000 bales of cotton per week for the years 1864 and 1865, that quantity would prove sufficient to find all the factory operatives wanting work full employment. This state of things would secure for the operative a high rate of wages; but it promises, too, I think, a corresponding advantage to the spinner, inasmuch as the curtailed consumption of raw cotton, and consequently a proportionate reduction in the quantity of yarn produced, would have the effect of keeping down the price of the former article, and enhancing that of the latter."

The Vintage of 1863.—Messrs. R. Symonds and Son, in their trade circular, state that with regard to Champagne the quantity, although less than in 1858, is much greater than in 1861 and 1862. It is difficult at this early period to form a definite judgment of the quality of the wines, but they show every promise of great delicacy of flavour. The Bordeaux vintage, taken as a whole, has been nearly equal in quantity to that of 1862, some of the districts producing more, others considerably less, than last year. In the Palus and "petites Côtes" and other districts producing ordinary wines, the quantity is for the most part greater than in the year previous; but in Médoc, the Graves, and the "Côtes supérieures," the produce is generally less. With respect to quality, they will probably be very inferior to the wines of 1862, and even to those of 1861. The Burgundy vintage, so far as regards the red wines, has been excellent. The wines have a good and deep colour, an excellent bouquet, much aroma, and a perfectly pure taste. They will probably, particularly in the lower growths, prove superior to the wines of 1862. The quantity will be fully equal to that of the last two years. The white wines have generally failed, more especially in Chablis, where repeated hailstorms devastated the larger portion of the vines. The quantities of Hermitage and Rhone wines are somewhat below the average. They will be delicate and of good flavour, but with less body than those of 1862. In the districts more to the south (Château-neuf du Pape, &c.), where the vintage has been somewhat later, it is expected that the quality will prove superior to that of 1862. The quantity in the Roussillon district is considerably below the average, but the quality will undoubtedly be fine. In other parts of the South of France, the vintage, taken as a whole, has been abundant, and the wines will be above the average in point of quality. The Rhine and Moselle vintage, especially in the "Rheingau" is very much later than in France, and is only now in operation. The quantity will scarcely exceed one-third of an average, and the quality will be only mediocre. It may indeed prove better than the vintage of 1860, but will be much inferior to those of 1857, 1858, 1859, 1861, and 1862, all of which are fine wines. It is to be feared, judging from past experience, that the cycle of good years is complete, or near completion, and that we are again about to enter upon a period of inferior vintages. In Madeira, there has not yet been time to learn the quantity produced in the present year, but it is scarcely possible that it can amount to 1,000 pipes in the whole island. Before the outbreak of the Oidïum, in 1852, the average production was 27,000 pipes. As the vines imported from Portugal have not generally succeeded, they are being for the most part rooted up and replaced by native vines in the districts really adapted for the plant. From the nature of the soil, &c., in Madeira, none but old vines will produce good wines, so that it must be yet a very long while before any effectual result can be perceptible as regards exports from the island; but, from the efforts making it is hoped that, in the course of years, Madeira may again produce wines (from the grape) suitable for exportation.

Colonies.

Slates of Canada.—Mr. R. Bell, of the Geological Survey, in a paper on this subject read before the Canadian Natural History Society, says that the annual value of the slates produced in Wales alone is nearly £1,000,000 sterling, and the net profits of many of the companies engaged in this branch of industry are upwards of 50 per cent. The most important slate-producing district in North America is situated in Vermont. But little of the deposit in Eastern Vermont can be profitably worked "owing to contortions, imperfect cleavage, cross joints, and the presence of foreign ingredients." Bands suitable for the manufacture of roofing slate were only found occasionally in this district. The quarries in the western part of Vermont appear to be more productive than those in the eastern part of the state. It seems that this slate is used for other purposes than roofing. Mantelpieces, table and bureau tops, billiard-table beds, and lamp bottoms are manufactured from it. The slates procured from the Northfield quarries, Vermont, sell at three and a half dollars a "square," delivered in the cars.

In Canada the price is fifty cents less per square, delivered at Richmond. A square of slates is 100 square feet; and the greater the number of slates making up this area, the less the price. The most important slate quarries in Canada occur in the Eastern Townships. Geologically speaking, they belong to rocks of the Quebec group. The author described other probably favourable localities for roofing slates in Eastern and Western Canada.

Dr. William Gill, a native of Scotland, who had lived in the Cape Colony for a long series of years, and had led a quiet, unostentatious, but useful life in one of the smaller towns of the coast, died lately. He had been impressed with the want of educational facilities in the land of his adoption, and bequeathed a sum of £20,000 to found a college in the eastern province. The money has been left under such terms and conditions as cannot fail to ensure the efficient carrying out of the benevolent gentleman's intentions.

The Mahogany Trade.—The price of mahogany is so low in England as well as the United States that it will not pay to cut it. It is said the cuttings in Honduras for the next year will not be more than one-third of the usual quantity, and the same in regard to logwood; so that the chances of trade for the year 1864 are very poor.

Climate at Howick, near Pietermaritzburg, Port Natal.—An emigrant writes, September 29th, 1863, as follows:—"We are tolerably comfortable out here, though our house has no fence round it, and cattle of various kinds prowl round our kitchen door, and the hens and chickens live in the pantry. The stable is only half roofed in, and we have but a thin iron roof between ourselves and the sky. When it rains, which it does with a vengeance at times, we cannot hear each other speak, and the noise it makes on the roof deadens the sound of the thunder, so our home is anything but a quiet one. The climate here is anything but what we had been led to expect. The thermometer was standing a few days since at 90° in the shade, and within three hours (at 3 p.m.) it went down to 42°, which effectually shut me up for the next 24 hours. The hot winds, too, are very trying, and unhealthy people, suffering from any illness, are frequently carried off if exposed to them at all, and, though sensibly hot, they give cold very readily. There is no doubt, however, that vegetables of different kinds grow here very rapidly, though the more delicate kinds, as peas, &c., soon become hard and tasteless; oranges, lemons, pomegranates, &c., grow in our neighbourhood very fairly; grapes are, strange to say, difficult to ripen; oats grow well; wheat not at all, as it is affected with disease just before ripening."

Natal.—The export of wool, the great up-country staple, has been considerably in excess of previous years. From the following statistics it will be seen that the value of the shipment of this article has steadily increased during the last ten years:—1852, £2,026; 1853, £3,450; 1854, £3.366; 1855, £8.331; 1856, £7.325; 1857, £9,887; 1858, £11,360; 1859, £23,988; 1860, £27,790; 1861, £32,887; 1862, £38,432; or 905,616 lbs. for last year. The export of wool to the 16th of July, 1863, had reached 905,600 lbs.; value, £37,848. The shipment for this period was, therefore, almost precisely as much, both in quantity and value, as the shipment for the whole of last year. The sugar season is now at its busiest stage, and the forty-seven mills that are scattered along the coast are hard at work. It is too early yet to give anything like a general average of the yield of this year. On many estates, however, between two and three tons per acre are being uniformly obtained. One or two cases have occurred where three tons have been yielded by plots of several acres each. A large crop may be anticipated. 5,000 tons has been estimated as the probable aggregate for the year. In all probability there will be an export of at least 3,000 tons. The want of labour is vigorously urged on all sides, and an increased crop only renders the need greater. Until the coolies that are believed to be on the way arrive, the pressure and inconvenience arising from this cause will be considerable. Welcome as this reinforcement of a thousand labourers will be, more yet are required. A requisition for five hundred more was signed sometime ago by anxious planters, but the government has replied that until more funds are in hand, no further batch can be sent for. There is a growing disposition to be independent, as far as possible, of capricious Kafir labour, and to rely upon imported labourers only. An influx of about 500 Amatongas, belonging to a tribe living north of Zululand is shortly expected, and the distribution of these will afford sensible relief. This demand for labour is a satisfactory indication, in so far as it shows that agricultural enterprise is active. During the last month several mammoth canes have been exhibited, some showing twelve feet of clear cane. Larger specimens are also said to exist. Tobacco is being generally planted in all parts of the colony; its thorough adaptation to the soil and climate induces its extensive growth. Arrowroot continues to be grown to a limited extent, and the favourable prices lately realised in home markets will give a stimulus to this valuable, though badly appreciated, enterprise. Coal has been found in great abundance in the neighbourhood of the Biggarsberg, and it is proposed to establish a line of railway from Durban to the Biggarsberg, up the Umgeni valley. The Union Company is now building a steamer specially adapted for this port. This vessel is 210 feet long, 120 horse-power, and is to draw under eleven feet of water. The *Athens* is also to be placed very shortly between Natal and the Mauritius, an arrangement that would give the colony bi-monthly communication with Europe, and bring it within 35 days' reach of England. Resolutions have been passed approving of about one million acres of Crown lands being thrown open to squatters, in runs of not less than 5,000 acres, and for a period not exceeding ten years, on payment of a small annual fee, and on certain conditions as to occupation and stocking. The necessity of increased European immigration has been affirmed, and a vote of £10,000, instead of £5,000 annually, has been asked for. The immediate introduction of a limited number of immigrants of certain classes has been requested. A proposal to give the Natal Land and Colonisation Company £5 worth of land, at a high upset, for every adult assisted immigrant it lands and receives here, has been conditionally assented to, and certain recommendations with regard to the despatch and reception of immigrants have been made. A historical report, recommending increased taxation of the natives, who now contribute to the revenue yearly two shillings and tenpence, against four pounds ten shillings contributed by the white colonists, has been received, and a general resolution based upon that recommendation has been adopted.

Forthcoming Publications.

Practical Illustrations of Upholstery Work, being new Designs for Window Draperies, Bed Hangings, Domestic and Ecclesiastical Upholstery, Temporary Decoration, &c., &c. Drawn and arranged by Alfred Standage. (*Atchley and Co.*) The publishers state that, in the examples which will be given, simplicity of arrangement will be a main feature, with due attention to those principles which are the basis of the varied styles of the Mediæval, the Renaissance, Louis XV., and the many other styles now in use for interior decoration. In order to show as much as possible in detail all parts of these designs, they will be published in small folio, so as to admit of their being drawn to the large scale of 1¼ inch, and in some cases 1½ inch to the foot; and the plates, printed on thick paper, will be issued unbound for the portfolio. The work will be complete in four parts, each containing eight plates. Part I., price 10s. 6d., will be published in January, 1864.

Publications Issued.

British Agriculture, by Professor J. Donaldson, Government Land Drainage Surveyor. (*Atchley and Co.*) Price £3 3s. This work contains a geological notice of the formation of the earth; a notice of ancient and modern architecture; treatises on soils and their special cultivation; rotation of crops, &c.; farm implements; animal, vegetable, and mineral manures; irrigation and drainage; animals; the management of grain and root crops, grasses, weeds; the dairy, the orchard, and the garden; farm buildings, fences, gates, and roads, farm accounts, farm agreements, valuations, tables for the purchasing of estates, &c.

Farm Buildings and Labourers' Cottages, with all their details, by G. A. Dean, Agricultural and Engineering Architect. With plates, 4to., price £1 11s. 6d. (*Atchley and Co.*)

Facts and Fallacies of the Sewerage System of London and other large Towns. (*Atchley and Co.*) The writer's object appears to be to give a complete exposition of what he believes to be its defects; showing the pestilence spread by its deposits in the sewers, and the impossibility of removing the matter by flushing; with plans of his own for its purification. Price 3s. 6d., 8vo.

Obituary.

James Beadel, of Gresham-street, and Broomfield-lodge, Chelmsford, died recently. He was one of the founders of the Central London Farmers' Club, to the success and usefulness of which he contributed by his lectures, and he will be remembered as one of the practical agricultural improvers of the day. He was elected a member of the Society of Arts in 1852.

Notes.

Rearing of Plants.—The Municipal Council of Paris have founded an establishment in the Bois de Boulogne, in which plants of every description are reared, and which are afterwards transplanted to ornament the public gardens of Paris. This plantation has lately been increased by an addition which forms altogether a superficies of 4,400 yards. Within this space there are 25 hothouses and 3,000 greenhouses, representing a glazed surface of 10,000 yards. One hothouse is appropriated to palm trees and other tall plants, of which there are at least 2,000. Another hothouse, 500 yards long, covers 250 camellias, and 2,500 fuchsias, of at least 100 varieties, are to be seen in another of 110 yards long. The hothouses are warmed by 22 machines for heating water, and by two powerful calorifères for producing hot air.

The Ludgate-hill Bridge.—A correspondent asks why it is "necessary that Ludgate-hill should be disfigured so entirely as it will be by the plan proposed? Why not have a *crystal bridge?* False sides of embossed and coloured glass, set some inches from the main structure (of course in suitable frame-work), would have a good effect by day, and a pleasing one at night, if illuminated behind."

Hotels.—A prospectus has been issued of the Anglo-Parisian Hotel Company with a capital of £200,000, in shares of £5. The object is to build a large hotel in Paris on the modern principle, "to be conducted upon a much reduced tariff, to meet the wants of the middle classes."

The Albert Institute, Dundee.—A public meeting, to promote the proposed Institute, has been held, Sir D. Baxter in the chair. The object was to erect an Institution, in which it was intended there should be a lecture-room, reading rooms, library, museum, and a free library and museum for the working classes, should the Free Libraries Act be adopted. The cost was estimated at £20,000, which it was proposed to raise by a joint-stock company, in 2,000 shares of £10 each. Of this sum £10,000 has been subscribed, but there had been no canvass of the general public, to whom it was now proposed to apply. The necessary resolutions were passed. Provost Parker moved that, as the Prince Consort manifested so great and enlightened an interest in the intellectual culture of the nation, it was fitting that the building should be called the Albert Institute. A motion, made by Mr. O. G. Miller, that the establishment of the Albert Institute is a desirable preparation for the reception of the British Association in 1865, was also agreed to.

Railway across the Andes.—A passage is said to have been just discovered near the city of San Fernando peculiarly fitted for a railway, which, by means of the Santiago line, would establish a direct communication between Chili and the Argentine Republic. The Chilian Government have directed a staff of engineers to examine the route.

Hotel Furniture.—A correspondent writes:—"The receipt of our 'Premium List' reminds me of a subject I had intended to write about, viz., the policy of offering reward for new forms of hotel furniture, appliances, and contrivances. Last autumn I noticed some new articles at the Grand Hotel in Paris, and being a shareholder in some of these over-grown palaces, I have an interest in the matter—economy of space, with utility, being most desirable."

Social Science Association.—The Council of this Association have resolved to hold their meeting next year in the city of York. The executive committee was at the same time authorised to carry out a proposed union between the Association and the Law Amendment Society, and arrangements are stated to be in progress calculated to increase the activity and efficiency of the departments, and to secure more definite results from the discussions at the annual meetings.

The Public Lamp Posts at Paris, which are of cast iron, are being coated with copper, by electro-depositing, so as to have all the effect of bronze. The large fountains in the Place de la Concorde have recently been taken to pieces in order to be thus covered. The work is done by M. Oudry, at Auteuil, who is carrying on electro-depositing on a gigantic scale. He has recently completed a full-sized copy in copper deposit of Trajan's column at Rome.

Metropolitan Railways.—Numerous projects have been announced in answer to the suggestions of the committee of the House of Lords of last session. A correspondent recommends that a large map, showing all that is proposed, should be prepared and suspended in the Society's rooms.

Labourers' Cottages.—The attention of the Prince of Wales has been drawn to the bad state of the cottages on his estate at Sandringham. His Royal Highness has evinced a disposition to remedy this state of things, and, after a personal inspection, he gave orders for immediate repairs and improvements to be made.

Prince Consort Memorial.—The site to be occupied by this Memorial is hoarded off in Hyde-park, the spot selected being a plot of turf between Rotten-row and the Kensington-road, exactly opposite the conservatory in the gardens of the Horticultural Society.

The International Exhibition at Vienna, announced to take place in 1866, at present makes no visible progress, because there is no Minister of Commerce. Plans have been prepared for erecting the building on the site of the old fortifications.

Correspondence.

Memorial Tablets.—Sir,—It surely cannot be true that the Board of Works have refused permission to some artists to put up a memorial tablet to Turner

Probably the Board stated that they had no authority. Surely, as the proprietor of a house, I am at liberty to put my own, or my father's, or grandfather's, or even the first father's name on my house if I am so minded. Is it possible the law gives Mr. Thwaites and his colleagues power to prevent my writing up that I am a barber, or any other profession or trade, or that my first cousin was Lord Chancellor born in that house; or must I ask leave and have my roman letters first approved by the Metropolitan Board? If any member can tell what is the state of the law, and will do so, he will oblige A Member of Twenty Years' Standing.

London Cabs.—Sir,—Why have Paris and Vienna public carriages so much better than London? Is it not on account of the wrong policy which limits the price of the carriage per mile to a fixed sum, and so prevents the competition of excellence beyond what sixpence a mile will remunerate? Why not have carriages at different prices as at Paris? Why should a monotonous price of sixpence per mile be the fixed sum? Why not let cab proprietors send out cabs at 8d. or 1s. a mile, and regulate the quality accordingly? For the protection of the public, it is only necessary to have the price distinctly marked in figures, and perhaps, also, in the colour of the carriage. Why prevent the Londoner from riding in a handsome dark green public brougham, with a good horse, at any price? The Council would do a public service if they would be at the trouble to collect together the experience of great cities abroad, and even Manchester, Liverpool, Birmingham, &c., at home on this subject. I am, &c., F. S.

Paris.—Louvre.—Sir,—Being lately in Paris, I noticed that very extensive alterations have been lately made in the Louvre. Several rooms have been newly decorated and arranged with objects from the Campana collection, and constitute a portion of the "Musée de Napoleon III." The Sauvageot gift is also shown in several rooms. But whilst noticing these changes, I would like to point out to Count Nieuwerke, that visitors, especially strangers, would be under great obligations if directions were given to provide water closets, which although abundantly established in Paris, are not to be found within ten minutes walk of the Louvre galleries. I am, &c., F. S.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Medical, 8½. Dr. C. H. F. Routh, "Diseases of Women and Children."
Royal Inst. 2. General Monthly Meeting.

Tues. ...Zoological, 9.
Syro-Egyptian, 7½. Mr. W. H. Black, "On Roman Mensuration in the Eastern Empire."
Ethnological, 8. 1. "Account of the Weddos, a wild tribe of Ceylon," by a Tamil native of that Island. 2. Mr. John Crawfurd, "On the Commixture of the Races of Man in the New World, as affecting the progress of Civilisation."
Civil Engineers, 8. Continued Discussion upon Mr. Morshead's paper on "Duty of the Cornish Pumping Engines." And, if time permit, Mr. J. M. Heppel, "On the Closing of Reclamation Banks."

Wed. ...Society of Arts, 8. Mr. John Chalmers Morton, "Agricultural Progress; its Helps and its Hindrances."
Archæological Association, 8½. 1. Mr. E. Roberts, "On Brixworth Church." 2. Mr. Saxe Bannister, "On Unpublished MS. Lives of Henry V." 3. Mr. Blaslick, "On the Discovery of a Well and other Roman Remains at St. Dunstan's-hill."

Thur. ...Royal, 8½.

Patents.

Grants of Provisional Protection.

[*From Commissioners of Patents Journal, November 27th.*]

(Agriculture) pulverising and cleaning the soil, and scattering guano, &c.—2861—J. Walmsley.
Bricks, drain-pipes, &c.—2708—E. Jones.
Charcoal, &c., saturating and cleansing—2855—L. Mackirdy.
Cigars—2831—H. F. Hodson.
Cloth, beetling and finishing—2829—W. Chambers.
Coal, excavating, &c.—2837—T. Harrison.
Cotton gins, &c., driving and feeding—2863—E. Leigh and F. A. Leigh.
Coupling or buckle—2740—B. Blackburn.
Docks, floating and other—2889—J. Elder.
Dramatic effects—2811—B. Hughes.
Fabrics, looped, machinery for—2891—J. Mackew.
Fabrics, woven, singeing—2853—G. Lindemann.
Flour dressing machines—2843—J. Ellison.
Fusees—2811—H. J. Simlick.
Gas burners—2823—W. E. Newton.
Gas-lighting—2800—W. R. Bowditch.
Gun barrels—2887—J. R. Cooper.
Harrows—2752—R. Sellar.
Hydraulic motor—2871—I. Pomès.
India rubber tubes, manufacture of, and covering telegraph wires—2893—J. G. Jennings and M. L. J. Lavater.
Iron, cutting and planing—2735—G. Craven, W. Craven, and J. Craven.
Jacquard machines—2885—R. W. Siever.
Metal plates, bars, and rods, tapering—2770—J. Dyson, J. Dyson, and G. W. Dyson.
Money, tills for—2851—G. H. Courtney.
Mules—2833—E. Spencer and J. Dodd.
Music stools, &c.—2877—F. W. Burton.
Neck ties, &c.—2813—B. Peake.
Ordnance, breech-loading—2879—V. Baker.
Pianofortes—2821—G. H. Brockbank.
Pictures, restoring—2568—M. Petenkofer.
Pipe joints and waterclosets, taps or valves in—2865—S. Cameron and W. Johnston.
Portmanteaus—2859—J. Southgate.
Railroad cars, springs for—2817—G. Davies.
Railway breaks—2798—F. Testuz.
Railway wrappers—2480—D. Lange.
Railway stations, moveable platforms for—2881—W. Pratchitt, J. Blaylock, and J. Pratchitt.
Raising and lowering bodies—2776—C. D. Abel.
Raising heavy bodies, &c., carriages and apparatus for—2825—D. M. Fyfe.
Salt, manufacture of, and boilers to be fed by salt water—2875—R. A. Brooman.
Sewage, liquid, &c., syphons for—2849—G. Barker.
Sewing machines—2764—W. E. Newton.
Ships for war—2895—P. St. G. Græme.
Ships, iron, fouling of the bottoms of—2847—A. Ellissen.
Ships' logs—2599—F. Bullock (Rear Admiral).
Steam hammers—2715—D. Davy, jun.
Steel, casting ingots of—2760—W. D. Allen.
Thrashing machines—2733—W. Audinwood.
Twisting cotton, wool, &c.—2815—A. Illingworth.
Wardrobes—2702—W. Law.
Watches, dead beat independent centre seconds—2827—B. Marriott and C. Radcliff.

Inventions with Complete Specifications Filed.

Engines, rotatory—2884—J. H. Johnson.
Fibre from *Zostera marina*, &c., extracting—2941—J. Steart.
Grain, preserving—2926—H. A. Bonneville.
Hempen thread, &c., production of, and mixing same with cotton, &c.—2950—St. G. Gregg and T. Gray.

Patents Sealed.

1356. F. Patureau.	1375. G. H. Cottam.
1371. H. C. Coulthard.	1377. G. A. Barrett, W. Exall, C. J. Andrewes, & A. Barrett.
1373. A. Illingworth.	

From Commissioners of Patents Journal, December 1st.

Patents Sealed.

1384. J. Travis.	1439. H. Bessemer.
1389. F. S. Barff.	1449. W. Clark.
1393. S. Blake, T. Lee, and R. Dutton.	1495. I. B. Harris.
1394. H. Rigby.	1503. W. Mainwaring.
1401. A. Q. de Gromard.	1557. J. Ellison and A. Rogerson.
1402. R. A. Brooman.	1597. A. Ripley.
1404. J. Seaman.	1630. A. Silvester.
1406. J. H. Johnson.	2173. C. Jackson.
	2237. W. Taylor.

Patents on which the Stamp Duty of £50 has been Paid.

2907. J. S. Manton and T. Inslip.	1827. E. T. Hughes.
3002. W. Clark.	2952. J. Ronald.
3904. I. Sharp and W. Bulmer.	2957. W. P. Piggott.
2924. N. Ager.	

Patents on which the Stamp Duty of £100 has been Paid.

2828. L. C. Stuart.	2831. J. L. Clark.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, DECEMBER 11, 1863. [No. 577. Vol. XII.

Announcements by the Council.

Art-Workmanship.

The works submitted in competition for the Prizes offered by the Society are now placed for the inspection of members and their friends, in the Society's Great Room, where they will remain until Christmas, when, with the view of their being exhibited to the general public, they will be removed to the South Kensington Museum, by permission of the Science and Art Department.

Copies of the photographs and rough castings issued for competitors to work from are also shown.

The Council have requested Mr. Richard Redgrave, R.A., Mr. Digby Wyatt, M.R.I.B.A., and Mr. John Webb to act as judges in awarding the prizes, and these gentlemen will shortly meet to make the awards.

The Art-Workmanship Committee has been re-appointed, and is now engaged in the preparation of conditions for the next competition.

Institutions.

The following Institution has been received into Union:—

West London Youths' Institute, Bayswater.

Wednesday evening Meeting previous to Christmas. Chair taken at 8 o'clock.

Dec. 16.—"On the Economic Value of Foods, having special reference to the Dietary of the Labouring Classes." By Dr. Edward Smith, F.R.S.

Courses of Lectures (under the title of "the Cantor Lectures") on the following subjects, will be delivered during the Session:—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. Hastings, Esq., Barrister-at-Law.

Fine Arts Applied to Industry. By W. Burges, Esq.

Chemistry Applied to the Arts. By Dr. F. Crace Calvert, F.R.S.

Mr. Hastings' course consists of four lectures, the first of which was delivered on Monday, the 7th inst. (See the next column.) The second will be delivered on

Monday, the 14th Dec., at Eight o'Clock.
Subject--The Law of Blockade.

The subjects of the two concluding lectures, to be delivered after Christmas, are:—

Contraband; its Nature and Usages.

Capture of Private Property at Sea; present State of the Law as modified by the Declaration of Paris; Arguments for and against its Continuance.

The Foreign Enlistment Act; its Operation on Commerce.

The Michaelmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

CANTOR LECTURE.

Monday, Dec. 7th.—The Law of Blockade.

Mr. Hastings, after some preliminary observations, said that International Law was of two kinds—public and private; the latter dealing with the international rights of individuals, the former regulating the intercourse of States, as political communities. As that intercourse was chiefly based on trade, it followed that the interests of international commerce were bound up with the development of public international law. This law came under two heads, as relating to peace and war. Passing by the first head, and coming to that which unfortunately occupied by far the largest space in the text books of publicists, the international law relating to war was again divided into that which related to war by land and that which related to war by sea. It was this latter which formed the subject of these lectures, and was much the more intimately connected with international commerce. It was possible to imagine war by land carried on without much interruption to commerce, but naval war struck directly and avowedly at trade, and was waged against peaceful property. Mr. Hastings proceeded to point out that international law lacks, to a considerable degree, the qualities of certainty and uniformity which distinguished municipal law, and that hence arose an ambiguity in writers on the subject against which it was necessary to guard,—a disposition to mix the ideas of what the law *should be* with what it *is*. This was the case with that part of the law which formed the subject of the evening's lecture—that of blockade; the French law of blockade, for instance, differing from the English, and English writers themselves varying in their opinions. He recommended for perusal the chapter on blockade in Dr. Travers Twiss' "Law of Nations," on the belligerent side of the question; Mr. Westlake's paper on "Commercial Blockades," taking the neutral view, and at the same time supplying a most learned and exhaustive history of the subject; and thirdly, those portions of Wheaton's "International Law"

(recently re-edited by the great American publicist, William Beach Lawrence) which deal with blockade. The purely continental view was of course to be sought in the writings of French international lawyers.

The origin of the law of blockade was not in the barbarous custom, once prevalent, of prohibiting all trade with an enemy's country, but in the belligerent rights necessarily attaching to a siege of a particular town. These rights, of course, included the forcible prevention of any intercourse with the place, whether by neutrals or belligerents. The usage, thoroughly recognised in this limited application, was first extended by the Dutch, who in 1584, and more explicitly in 1630, declared the various ports in Spanish Flanders under blockade. Thus arose the institution of commercial blockade, or the sealing-up of a line of coast, and of purely mercantile ports, against all commerce. The natural struggle of neutral and non-maritime powers to narrow the application of that law, led to the demand, now universally conceded, that blockades should be effective. But here came in the uncertainty of international law—What is an effective blockade? Mr. Hastings described the different doctrines held on this point, by the French and continental nations on the one hand, and the English and Americans on the other. He showed that the practice pursued during the great war with France was, on both sides, by Napoleon in his Milan and Berlin decrees, and by the British Government in their Orders in Council, opposed to the real principles of public law, and was in fact a return to the mediæval barbarism of prohibiting trade with an enemy's country. The wise and temperate course pursued by France and England in reference to blockade during the Crimean War, and the admirable judgments delivered at that time, were a guarantee that European civilisation had passed the possibility of such outrages; and the Declaration of Paris, in 1856, indefinite as its terms may be, had given an international embodiment to that enlightened policy.

Fourth Ordinary Meeting.

Wednesday, December 9th, 1863; John Grey Esq., of Dilston, in the chair.

The following candidates were proposed for election as members of the Society:—

Attwood, Matthias Wolverley, F.R.G.S., Dulwich-hill, S
Bowyer, Rev. W. N. Wentworth A., Rectory, Clapham common, S.
Brown, Henry, Ettrick Mills, Selkirk, N.B.
Cotton, Charles P., 11, Lower Pembroke-street, Dublin.
Cutler, Joseph, 4, Pollington-villas, Holloway-road, N.
Ellis, Wynn, 30, Cadogan-place, S.W.; Ponsbourne-park, Hertford; and Tankerton, near Canterbury.
Forbes, H., 6, Aberdeen place, Maida-hill, W.
Hanson, Reginald, 43, Upper Harley-street, W.
Hardwicke, Robert, 192, Piccadilly, W.
Johnson, William, 188, Tottenham-court-road, W.
Kiessler, T., 18, Spencer-street, Goswell-road, E.C.
Lumley, Henry, 4, Guildford-place, Russell-square, W.C.
Maynard, Henry, Oakfield-lodge, Hawkhurst, Kent.
Mercer, Thomas, 45, Spencer-street, Goswell-road, E.C.
Needham, John, Albert Iron Works, Warrington.
Nicholson, W. W., 17, King-street, Cheapside, E.C.
Shand, James, Upper Ground-street, Blackfriars, S.
Southorn, Edwin, Broseley, Salop.

The following candidates were balloted for, and duly elected members of the Society:—

Aldridge, Major, 17, Cadogan-place, S.W.
Austin, Albert Duncan, Nelson, New Zealand.
Austin, Henry de Bruno, 34, Up. Hyde-park-gardens, W., and Castle-hill, Ealing.
Azémar, J. C. 40, Mark-lane, E.C., and The Waldrons, Croydon, S.
Baker, Charles, 15, St. Petersburgh-place, Bayswater, W
Bulwer, William Earl Lytton, 24, Portman-square, W.
Burney, G., Tank Factory, Millwall, E.
Burt, John Mowlem, Grosvenor-house, Millbank, S.W.
Campbell, James, 6, Founder's-court, Lothbury, E.C.
Carrington, S. R., Stockport.
Cookson, Wm. Strickland, 6, Lincoln's-inn, W.C.
Corderoy, John Kittle, 8, Chester-place, Kennington-cross, S.
Crowther, Benjamin, Queen-street, Wakefield.
Fort, Richard, 24, Queen's-gate-gardens, W., and Reed-hall, Clitheroe, Lancashire.
Haigh, Henry, Holme Vale Dye Works, Milnsbridge, near Huddersfield.
Hamel, Felix John, Custom-house, E.C., and Church-street, Stoke Newington, N.
Hancock, George, 36, Carey-street, Lincoln's-inn, W.C.
Lancaster, George, 50, Hanover-street, Islington, N.
Le Rendu-Hamilton, E., 3, Alma-ter., Kensington, W.
Lister, Thomas Villiers, 61, Eaton-square, S.W.
Marcet, Dr. William, F.R.S., F.C.S., 1, Torrington-street, Russell-square, W.C.
Turner, James William, F.R.C.S., 30 and 31, Lower Phillimore-place, Kensington, W.
Voelcker, Augustus, 101, Leadenhall-street, E.C.

And as Honorary Corresponding Member,

Merlato, Le Commandeur G. G., Consul de S. M. l'Empereur d'Autriche à Tunis.

The Paper read was—

AGRICULTURAL PROGRESS: ITS HELPS AND HINDRANCES.

By J. Chalmers Morton, Esq.

It is the object of this paper to illustrate the fact of agricultural progress—to specify the circumstances by which it has been promoted—and to enumerate some of the obstacles by which it has been hindered. A discussion of the helps and hindrances amidst which it has been accomplished ought to be of service to it in the future; and it is as an introduction to such a discussion that the following statement has been prepared.

First.—Of the fact that great progress and improvement have been witnessed in our agriculture during the past quarter of a century.

This is just the period during which I have been in the ranks, and as, during the past 20 years, it has been my weekly occupation to narrate particular examples of agricultural improvement, and to record the circumstances to which they have been owing, it may be thought an easy thing for me to prove and illustrate the general agricultural progress which has thus been made. On the contrary, it is an extremely difficult thing to do so in any satisfactory manner.

For agricultural progress, if of any interest or value whatever, simply means more food produced per acre, and of our food produce we have no statistics.

Imports and Sales.

Such records as we possess do indeed appear at first to deny the existence of any such progress as is asserted. Certainly they prove that our agriculture is now farther short of supplying us with the food that we consume than it ever has hitherto been. The annual import of wheat and flour of wheat, reckoned together, which amounted in 1845 to 1,142,000 quarters, and in 1846 to 2,340,000 quarters, varied between 3 and 5 millions of quarters per annum between 1847 and 1859. In 1860 it exceeded 7,000,000, in 1861 it exceeded 8,000,000, and in 1862 it amounted to 11,528,445 quarters—more than ten-fold what it was in 1845. And the annual importation of other kinds of grain and meal has also increased during the same period. Varying in general from 4 to 5 millions of quarters between 1846 and 1859, it exceeded 7,000,000 in 1860-61-62.

These last three years have, we know, been very unproductive in this country, but even if we disregard the ex-

cessive importations of these three years as altogether exceptional, there remains the fact of an enormous, and, on the whole, increasing dependence on foreign supplies during a long series of years before. And this, I say, appears at first to be incompatible with the idea of any great agricultural progress at home.

There has been no corresponding increase in the quantity of meat or in the number of cattle and sheep imported. The number of oxen has varied irregularly during the past 15 years between 60,000 and 100,000 per annum, and that of sheep and lambs between 130,000 and 300,000 per annum without much indication of an increased importation year by year. Nor have the imports of bacon, beef, and pork materially increased except during the last two years. But, admitting that we are not on the whole so increasingly dependent on foreigners for our meat as we are for our bread, it must be remembered, on the other hand, that the prices of our home-produced meat have been gradually rising. The best fat Hereford oxen were sold for little more than 5d. per lb. 18 or 20 years ago—they are now worth nearly one-half more. Mutton, in like manner, has risen from 6d. to 8d. and more per lb. And from this, as from the increased importation of grain, it does not at first appear as if the agricultural progress which we boast meant an increased produce of food. I need not refer in detail to those importations which supplement the produce of particular districts; but these, too —the imports of butter, cheese, and eggs—exhibit in an even greater degree the increasing deficiency of our home supplies.

And there is yet another set of figures which, taken for what they are worth, seem even more to throw doubt upon the assertion that our produce per acre is increasing. In order to determine from year to year the value per quarter of those quantities of wheat, barley, and oats, into which the tithe has in every parish been commuted, it is provided by law that a record be kept in all the principal English market towns of the quantities and prices of wheat, barley, and oats sold on every market day throughout the year. There is a certain, and if we might suppose an unvarying degree of obedience paid to this law, then the amounts thus declared to have been sold would bear a constant proportion to the quantity of grain sold throughout the country, and they would fairly indicate the varying produce of our crops from year to year. That they do to a certain extent represent the productiveness of the year appears from the fact that they do rise and fall with the admitted character of the harvest. Thus, the quantity of wheat recorded as sold, which is generally about 5,000,000 quarters per annum, was, in the unproductive years of 1860, 1861, and 1862, 4,600,000, 4,289,000, and 3,588,000 quarters respectively. But what is noteworthy, if it can be at all taken as indicating the general productiveness of the country, is that the largest quantity recorded since 1844 was 6,666,000 quarters, sold in 1845; that the quantity was somewhat under 5,000,000 quarters per annum from 1844 to 1854; that it was somewhat over 5,000,000 quarters per annum from 1855 to 1859; and that it again, as already said, fell considerably below 5,000,000 quarters per annum during the past three years. Certainly there is no indication here of increasing annual productiveness. And the sales of barley and oats, similarly recorded, are equally unsatisfactory to those who would naturally hope to see in these records some indication of the increasing productiveness of our arable lands.

Of course the great majority of those who examine these figures, will find for themselves some explanation of them that is consistent with the belief which will be retained that our agriculture *is* nevertheless greatly more productive than it was.

Every countryman can point to so many instances of agricultural improvement within his own knowledge that, whatever the explanation be, he knows there must be some way of reconciling these figures with the fact of which he is certain, that land upon the whole produces now much more than formerly.

But before I proceed to justify this belief by marshalling the evidence on which it rests, it is right that we should be aware that it has been always possible to lead a proof by instances and examples of the productiveness of English agriculture.

Listen to Mr. Thompson, of Kirby Hall, near York, who, as President of the Yorkshire Agricultural Society, had last year to review the agriculture of the 20 years during which the society which he had helped to found had been in operation. He said that he had been a constant attendant at the shows of that society, and a very frequent one at those of other societies, and he was confident that the prize animals shown by Lord Spencer, Messrs. Booth and Bates, and others, in the early days of the society, were as good in every respect as those shown by Col. Towneley, Mr. Fawkes, Lord Feversham, and other noted breeders of the present day, and the same might be said of other classes of stock. Then as to the crops— it was usual 20 years ago to grow five quarters of wheat per acre, and not uncommon to grow six. Occasional instances could be found where the produce had been greater still, and he had yet to learn that they could do more now. The best cattle and the best crops are no better now than then.

It is plain, therefore, that though I were to bring before you hundreds of examples of productive farming in operation now, yet as I should be doing no more than another might have done with equal force 20 or 30 years ago, I should not thereby establish the advance which I believe has been made during the interval. Although therefore I shall refer to one or two particular instances of the progress which has been accomplished, yet it will be rather by a collection of testimonies from land agents and tenant farmers in different parts of the country, of the general condition of the land as to productiveness now and 20 or 30 years ago, that I propose to prove the general progress which has been asserted.

Districts of Stationary Fertility.

Of some districts I suppose this progress cannot be asserted—their produce has not increased. Thus I have before me a curious table, giving the produce of wheat on a large fen farm in Lincolnshire, from 1839 to 1862. The average produce of the wheat harvest during that period has been close on 39 bushels per acre—but it has varied irregularly between 44 and 24 bushels, without any indication whatever of a gradually increasing fertility. The produce per acre runs thus in bushels per acre in successive years:—34, 40, 35, 43, 38, 48, 32, 41, 42, 43, 44, 28, 45, 47, 41, 45, 26, 47, 48, 40, 26, 24, 27, 34. These four last being the produce of 1859, 1860, 1861, and 1862.

"You will see," says the tenant of this farm, "that we are not at all improving in the yield of wheat, which is the great staple of this district. The oat crop has been more productive than formerly, or we should have been worse off, and stock have left more profit than usual, but with those helps I never knew three consecutive years so bad as 1859, 1860, and 1861. The rents generally have been raised from 5s. to 10s. per acre during that period."

Another correspondent in the same neighbourhood, speaking of the meat produce of the fens, says:—

"I should think the amount of meat produced, and the quantity of live stock kept in the Fens, has decreased rather than increased during the last 15 or 20 years. Since railway facilities have been afforded, a good deal of land has been employed in the production of potatoes, carrots, &c., for the London and Birmingham markets. Some of these crops, on land suited to their cultivation, have realised good prices per acre, and have been as paying and profitable as the grain crops."

Another district of stationary agriculture, or rather class of districts it may be called, includes all those richly manured suburban holdings which around our large towns are cultivated rather as market gardens than as farms, and which have always been maintained in the highest state of fertility. If we except some considerable tracts

of light land which have long been well farmed, where, as Mr. Hudson, of Carthen, says, they have been in the same "rut" for a quarter of a century, consuming, on a single tenancy, £2,000 or £3,000 worth of oil-cake, and using £1,000 worth of artificial manure per annum, and where the land, therefore, has not much capacity of additional improvement in it, these are probably the only large tracts of land in the country of which no progress is reported, the one owing to the high degree of fertility which drainage and marling had at once conferred upon it, and the other because of the high artificial fertility which it has always possessed.

Testimonies to Progress.

Now for the large remainder. Beginning in the North, I would state generally there cannot be a doubt that it, more than any other part of the island, has benefited by the importation of guano and the manufacture of artificial manures during the past 20 years. It has also benefited as much as any other part of Great Britain by the extension of drainage and of deeper tillage, and by the improvement of stock.

Thus Mr. Simpson, of Beauly, Inverness, says the live stock on the waste land of his district has increased one-half during the last 20 years. Mr. Fraser, of Culloden, says during the past 20 years great improvements have taken place. Waste land has been brought into cultivation, and old land has been drained, and in many places the face of the country has been changed. Though the gross produce has increased, yet the produce of the best land has not altered. Rents, however, have greatly advanced. Mr. McCormack, of the vale of Alford (Aberdeenshire), says, "within the past 20 or 30 years rents have greatly increased. Railways have been introduced. Wages have risen 75 per cent. Much land has been reclaimed; much land has been furrow-drained and made fruitful." Mr. Drennan, of Ayr, has in like manner given me an elaborate report of the alterations and improvements in his county, and of the share taken in them by the agricultural societies of the country. To this I shall refer again.

Except that it does not mention the increased growth of the potato crop, by means of which such enormous rents are paid in many parts of Scotland, and by which a largely increased produce of food has been obtained, the following report by Mr. McLean, Secretary of the Wigtown Agricultural Society, and specially descriptive of the county of Wigtown, will apply to many other districts:—

"During the last 20 years there has been a remarkable advance made within the bounds of the society, particularly in the cultivation of green crops, and the feeding of cattle and sheep for the English markets, to which ready means of access have been, during all that period, afforded by our excellent iron steamer (the *Countess of Galway*) plying regularly between the ports of the district and Liverpool, and for the last two years and a-half by the Portpatrick Railway Company. In many farms the dairy system (with Ayrshire cows) has been successfully introduced. I believe that the improvement of the district has been mainly owing to the introduction of imported manures (chiefly bones and guano), and the consequent increased extent of green crops and ready means of conveying fatted stock to the English markets."

In Berwickshire Mr. Wilson, of Edington Mains, reports thus of the improvements during the past 20 or 30 years. After referring to the great extension of land drainage during the past 20 years, he says:—

"When I began farming, exactly 34 years ago, the application of bone dust as a manure for turnips was just getting into general use in this district and the slicing of turnips for hoggets was then unpractised among us. In 1830 or 1831, I happened to procure a turnip-slicing machine from one of the Midland Counties of England, which—so far as I have been able to find out—was the first that was used by a tenant farmer in this county. In a very few years after that date the universal use of bone-manure caused an immense increase of the acreage annually under turnips, and also of the weight of produce per acre. The general adoption of the practice of slicing turnips for hoggets soon after changed our whole system of sheep management. Our hoggets began to be sent to market as soon as they were shorn, say at 15 months old, instead of being kept until about two years old, as had been the previous practice. The use of bone-manure produced nearly as great an improvement upon the seeds as upon the turnip crop to which it was directly applied. This increase of the green crops and earlier marketing of the hoggets produced of course a greatly increased demand for lambs, and thus led to corresponding changes of practice on the upland sheep farms, from which the supplies of store sheep were drawn. Instead of an annual crop of two or three years old wedders of the pure Cheviot or Blackfaced breeds, they began to cross their ewes with Leicester rams, and sold these cross-bred lambs at weaning time to the Low country farmers. The command of portable manures has enabled the occupiers of these up-lying farms to bring much additional land under tillage. This process is steadily extending; and as it does so, the command of green crops thus obtained is regularly accompanied by a change to a sheep-stock of a more valuable class. All these practices date earlier than 20 years ago; but they have been greatly extended and developed since then. The introduction of pipe-tiles for draining, and of guano, nitrate of soda, and bones in the form of superphosphate as manures, has supplied great additional facilities for all this. Until thirty years ago linseed-cake may be said to have been unknown in this district. About that time it began to be used in the rearing of calves, and gradually a good many farmers began to give a little of it to their fattening bullocks for a short time before sending them to market. Now cakes of various kinds and other farinaceous feeding stuffs are in general use for the fattening both of sheep and cattle. The trade in these articles and portable manure has here as elsewhere grown to an important branch of business. Thorough draining, portable manures, artificial feeding stuffs, are now trite expressions; but when it can be reported of a district or county that all of them are included—less or more—in the cultivation of very nearly the whole of its farms, it is superfluous to add that a very great increase of produce has been the result. It has been said that every cwt. of guano applied to our farms is equivalent to the importation of a sack of wheat. Whether this be a strictly accurate statement or no, there can be no doubt that green crops, live-stock, dung, corn, is a true sequence in agriculture, and that an increase of the first item really means an increase of all the rest."

Coming further south, I have the following excellent report from Mr. Stephenson, of Fourstones, near Hexham:

"I think no change which has taken place in the farming of this district since 1840 will so much strike the practical farmer as the increased quantity of turnips grown, and, as a natural consequence, the very large extension of sheep-feeding. The general management of the district has so wonderfully improved, from the cause I have stated, that anyone will at once perceive from what cause arises the increased value of land. The introduction of leases with clauses for unexhausted improvements has aided no little towards our progression, and I still hope to see enterprising tenants more liberally dealt with, which I think will be one of the best ways of giving birth to future and permanent improvements. The much earlier period at which sheep and cattle are brought to market must not be overlooked, for not only is this one of the most interesting parts of farming, but it possesses the additional advantage of bringing a quicker return for the outlay of capital. Perhaps one of the most striking, and, in its results, one of the most beneficial improvements that has taken place in this district is the greatly improved method of conducting our harvesting operations; reaping corn is entirely done by machinery and short scythes, and the beautifully low and even cut fields present a pleasing contrast to the knee-deep stubbles of 20 years ago. Nearly the whole of the district has been thoroughly drained, and pipe tiles have taken the place of the old stone drains. In summing up improvements since 1840, we notice the general management of the district wonderfully improved; the extension of green crops, which has greatly enhanced the value of land; the greatly increased number of sheep and cattle reared, and the much earlier period at which they are brought to market—the improved method of cutting corn and harvesting in general—the improvement in agricultural implements—the success which has attended thorough draining, and the introduction of farm leases with clauses for unexhausted improvements. The high rate of wages which the agricultural labourer receives is to be attributed in a great measure to the demand for labour at the lead mines and collieries. Hinds are receiving from 15s. to

17s. per week, with privileges which cannot be less than 3s. per week. They are energetic and persevering, show much skill in the several departments of the farm, and readily learn the working of any new implement. There are now good schools in every parish, and as many of the men are receiving an income of £50 per annum (independent of the money earned by their wives and families), it will be seen they have every chance of giving their children a sufficient education."

It is in this district that the Greenwich Hospital estates lie, which have for so many years been under the management of our Chairman—during which time the interests of landlord, tenant, and labourer, have alike prospered. An additional £10,000 a year as rent is now remitted to the landlord—the arrears are *nil*—cottages are improved, and wages are increased. And of course all this has come out of the increased produce of land.

"The increased produce," says Mr. Gray, "consists more in root crops and the amount of stock kept, than in corn, although the crops of corn have also partaken of the benefit of better cultivation. The total increase upon farms where thorough draining and deeper cultivation are practised, must at least be one-third; in some instances it is more, but that is not yet apparent in the rents, for it is only obtained by a greatly increased expenditure by the tenant, in extra manuring and cultivating; and, besides, the value of the improvement is not found by the landlord till the end of the lease. All such increased outlay by tenants contributes no doubt to the welfare of the labourers, whose condition in this county has been greatly improved during the last 30 years, by the general improvement of their dwellings and advance of wages."

I have a very interesting report from Mr. Sweeten, the Hon. Sec. of the Penrith Farmers' Club, of the improvements which during the last 20 years have taken place in Cumberland and Westmoreland. Rents have risen some 15 per cent., wages have risen 25 per cent.; the live stock of the locality has improved, and the extension of land drainage, and the increased use of artificial manures and feeding stuffs, have added materially to the produce of the land.

Hear now the following valuable account of North Lincolnshire improvements, by Mr. Sowerby, of Aylesby:—

"The improvement in farming in North Lincolnshire has been very progressive for the last 30 years and upwards. I dare say you are aware we farm almost altogether on the four-course system, turnips, barley, &c., seeds, and wheat, the turnips for the most part fed off by sheep with a liberal allowance of oilcake. This management, with a good quantity of oilcake used in the fold yards, will always insure improvement in land. Half inch bones to a great extent are used for the turnip crop, and perhaps to a greater extent 20 years ago than they are now. Superphosphates have taken their place a good deal of late years; and of course that is the same thing, but not so lasting. Good crops of roots fed off by sheep are the great improver of land, and moreover what enables us to pay our rents; for nothing pays like sheep. A considerable extent of land in this part of Lincolnshire, termed the "Middle Marsh," that is, land lying from the foot of the Wolds to the marshes adjoining the sea and Humber, required underdraining, which, to a great extent, was done about 20 or 30 years ago about two feet deep with sods and bushes. That improved the land very much, and paid well for doing. Those drains of course after a time failed, but still lasted nearly 20 years when done well. For the last 10 to 15 years draining has gone on upon that land with pipe tiles put in from 3½ to 4 feet deep. This district of country is likewise farmed upon the four-course system, just as the Wolds. A good deal of this was ordinary grass land, a good deal of which is ploughed and makes good corn land. I have myself taken up nearly 300 acres, the last 30 years, upon Aylesby farm. In addition to growing so much more corn, the same land will keep a great deal more stock. At the first glance you hardly could believe that. Bear in mind that though it is inferior grass land, it becomes the best of corn land, growing good root crops, and keeping a great deal of stock. I have been 40 years at Aylesby, and I think I speak within bounds when I say I have grown double the quantity of corn and kept double the quantity of stock this last 10 years that I did the first 10 years I was a farmer, though of course I have been at considerably more expense. For the most part we have liberal landlords, particularly our larger landed proprietors. Wages are good; the lowest I gave last winter was 13s. 6d. per week, and this winter I dare say will be the same, though perhaps in many instances they may be down to 12s. for our common labourers. We do a good deal of work by the piece. I shall not grumble if my men that are draining earn 20s. per week, which I daresay they will do."

In the neighbourhood of Grantham, Mr. Charles Beasley, of Harston, informs me—

"There has been a very marked improvement in this district during the last twenty years, both in the quality of the stock bred and in the management of it, especially in the eating off of turnips with sheep. The great majority of farmers are now cleaning their turnips, cutting them up, and using large quantities of dry food with them, which has very much mitigated the prevalency to disease, which was a very serious impediment to successful sheep keeping in this neighbourhood."

Let us now cross to the dairy districts of Cheshire. Mr. Palin, of Stapleford Hall, near Tarvin, writes:—

"Great progress has been made in this county within the last 20 years; the increase of stock, both in cattle and sheep, is very considerable; in some instances nearly doubled, and this arises principally from the great improvement of our clay land pastures by the use of bone manure, by draining, and a more extensive cultivation of green crops, although it would be difficult to show by figures, with any great accuracy, the amount of such increase, either as regards cattle, sheep, or cheese, in consequence of the great changes in stock, from cattle to sheep and *vice versa*; and also an increase of tillage occasionally on many of our farms during that period caused by that dreadful scourge, pleuro pneumonia."

From the same county Mr. Rigby, of Fenny Wood, Winsford, also writes:—

"The most decided improvements observable in the last 20 years have been seen in draining and boning grass lands. The principal product of this county, as you are aware, is cheese, and the quantity of this commodity has been quite doubled by the application of bones on the pastures and of draining, although there is yet much of the latter to be done. I know many farms that used only to keep 40 cows ten years ago that now milk 80, and one farm which then kept 60, has now 140 milking cows on it, besides other stock, and this has been effected principally by these means; the stock, too, are better kept in the winter than formerly, and come to calve in much better condition, and as a consequence give better results."

I must not fatigue you with the multitude of witnesses who might, if there were time, be brought into Court, and I shall quote only a few more.

Mr. Howard, of Bedford, writes as follows:—

"The great improvements in cultivating the land during the last 20 years are almost confined to clay land; our light lands were farmed almost as well 20 years ago as now. Thousands of acres of clay have during this period been underdrained thoroughly with tiles; the growing of summer feed, such as tares, is extensively practised; the growing of mangel is a great boon; summer fallows are almost abolished; and the live stock kept is greatly increased—indeed, some of what were considered poor clays grow our best barley, and will, with the aid of steam, be worth as much as the light lands. I cannot give you 'any instances of produce, rent, or wages,' but all have risen, the produce and rent in the larger proportions; still the introduction of piece-work has greatly benefited the labourer, and day wages have incerased from 9s. to 11s., and from 10s. to 12s. per week, according to which side of the county I take."

This is in keeping with reports from Norfolk and from Essex. The lighter lands of the former county, which do not need drainage and have long been liberally treated with artificial manures and well fed stock, have not such capacity of improvement in them as the heavier undrained soils of Essex, from which county we have reports of improved tillage, extension of root crops, diminished bare fallow, and improved crops, upon clays improved by land drainage and by deeper and better tillage.

Let us now travel to the end of our story by the other side of the country. Mr. Bowley, of Siddington, near Cirencester, has given me an elaborate and most satisfactory report on the advantages of drainage, artificial manures,

and improved machinery, as exhibited in the Cotswold district, where improved root crops, improved cattle and sheep, and better grain crops, have all increased the produce of the district.

Mr. Holborow, the Secretary of the Tetbury Farmers' Club, says of this district:—

"In the growing and management of root crops the improvement is very marked—autumn cultivation, drilling, horse-hoeing, the liberal use of artificial manures, securing the root crops in heaps covered with earth, being pretty general. In live stock the improvements may be said to consist in a greater quantity being kept of an improved sort, earlier maturity and quicker preparation for the butcher being to a considerable degree manifested. The consumption of corn and oilcake by cattle and sheep is also largely increased, and the consequent effect on the crops of corn (coupled with better and more liberal management of the land generally) is patent to every one. The better employment (and payment too) of the labouring population is one happy result; their most respectable and comfortable appearance being very apparent, even though, alas, their cottage accommodation has not kept pace with other things, whilst their better education adds to the necessity and desirability of this. However, there is one class whose material interest has certainly kept pace with the other subjects of improvement, viz., the landlords, in a considerably augmented rent roll."

Mr. Rich, of Didmarton, adds:—

"As an illustration of the advance of agriculture in this neighbourhood (part of the Cotswold hills) witness the improvement of live stock; the steer is now frequently made fat at about 2¾ years old; the sheep, which formerly arrived at maturity at 2¼ or perhaps 3 years, is now the same weight, and frequently too heavy for the butcher at 1 year and 2 months old, yet wintered in the open field on roots, &c., leaving the richest manure where it is at once required."

I add a report from Wiltshire. Mr. George Brown, of Avebury, writes as follows:—

"The improvement in the cultivation of the soil is very great; a much greater abundance of stock is kept and brought out at a much earlier period, as regards age, and very much higher in condition, consequently much more valuable. Admitting this to be correct, I consider the great improvements in the cultivation of the soil and in the increase in stock, and condition in which they are brought to market, is at so great a cost to the farmer, as to leave a very small profit to him at the end of the year, but, on the other hand, it is a great advantage to the community at large."

Mr. Scott Hayward, of Folkington, Sussex, speaking of the light land and down district of the county, says:—

"The disposition to break up down land is increasing every year, and a very large extent has been brought under cultivation in the last 20 years; the use of artificial manures has increased to an immense extent with the breaking up of this description of land, and also the consumption of purchased artificial food (chiefly oilcakes); the result of which is a larger quantity of sheep kept, and much better kept than formerly, no doubt gradually increasing in size,—a much larger produce of corn, and a much larger employment of labour. The use of bought cattle food has also greatly increased upon the poor and second class low land pasture farms, cattle and sheep being now fattened upon this description of land, by this means, that formerly only kept them in fair growing condition. Oilcake is also now used very generally in keeping store cattle in the winter in yards upon straw or hay; formerly this description of stock was merely kept alive through the winter, and frequently to be seen going down to the marshes in the spring very little more than skin and bones. Latterly, by the use of oilcake with the fodder, poor stock is seldom to be seen. The great and gradual increase in the use of artificial manures, and the consumption of bought cattle food is the most important feature in the recent history of Sussex farming."

Mr. Benson, of Tavistock, speaks of the vast advancement made in his locality during his acquaintance with it.

The following report from Hampshire, by Mr. Blundell, of Southampton, must conclude my quotations:—

"I offer you my estimate of the progress of the farming of our district, in a tabulated form, as the result of close observation since I have occupied my farm, for 32 years past. I estimate as follows:—

Crops.	1840 to 1843. Average produce per acre.	1860 to 1863. Average produce per acre.	1843 to 1863. Acreage grown.	1843 to 1863. Quality.
Wheat	24 bush.	29 bush.	incr. 25 per cent.	no improvement.
Barley	28 „	32 „	decr. 20 „	deteriorated.
Oats	34 „	42 „	incr. 10 „	improved.
Beans	24 „	26 „	incr. 10 „	no improvement.
Peas	22 „	24 „	incr. 10 „	no improvement.
Rye for feeding	...	...	doubled.	...
Tares ditto.	...	...	doubled.	...
Grasses for hay and feeding .	...	...	decr. 25 per cent.	no improvement.
Swedish turnips	13 tons.	16 tons.	decr. 20 „	deteriorated.
Common turnips	12 „	15 „	incr. 5 „	deteriorated.
Mangel wurtzel	18 „	25 „	incr. 15 „	improved.
Cabbages, carrots, kohl rabi, &c.	15 „	20 „	incr. 10 „	improved.

Live Stock	1843 to 1863.
Horned cattle, fattened	double the number.
Dairy cattle	increase 10 per cent.
Calves raised for dairy purposes	„ 10 „ „
Calves raised for fatting purposes	„ 30 „ „
Value of cattle raised at two years old ...	„ 16 „ „
Sheep stock for breeding purposes	„ 25 to 30 „
„ fatting purposes	„ 50 „ „
Value of sheep stock of all ages	„ 20 „ „
Swine of all ages	„ 30 „ „
Value of ditto.	„ 10 „ „
Horses for farm work	no increase.
Value of dittto	increase 15 per cent.

Great losses by diseases unknown before 1840 have been reported of cattle and sheep.

In the above attempt to tabulate this information, please observe that I make no reference to actual prices, as they may vary, but in speaking of value I take the real or improved value; with regard to produce, I only allude to increased production, and not to variation of crops. In speaking of increase of live stock, I make no allowance for losses by disease; they have, however, been enormous, past all calculation, and the improvement both in number and quality of sheep and cattle must have very far exceeded my present estimate had they been as free from disease as previous to the year 1840. In speaking of root crops, such as Swedes and turnips in particular, deterioration in feeding quality has gone on, consequent upon repetition of the crop and the application of stimulating manures. The value of land has been raised in rental since 1843 from 4s. to 6s. per acre, and may be attributed to various causes, amongst which are the commutation of tithes, the competition for farms by parties who require a healthy and pleasant pursuit, and by those who possess capital for which an investment is required; and there are applicants for farms resulting from the scientific education of young men for the business of farming. The actual returns, as profit for investment on the farming account, do not warrant the increased rental above alluded to. The quantity of land absorbed by railways, and the public works of government and companies of various kinds, and the increase of towns, has taken more land out of the market for occupation than has been supplied by recent enclosures. Although the recent enclosure act has facilitated the enclosure of waste and commonable lands, yet much more may be done in this respect."

I have thus collected a number of testimonials and opinions from practical farmers and land agents of long and large experience in various parts of the country, all concurrent to the effect that the agricultural produce of this country is now much larger than it has ever been before, that the fertility of the land is increasing, and that both in bread and meat of home produce we are really better off than formerly, notwithstanding that our imports of food have also largely increased, in order to supply our better fed and larger population. All this might have been as well illustrated though not better proved by a number of definite instances of improvement. I have, however, preferred the other plan of putting the fact before you, for one

reason among others, because I believe that the somewhat indefinite, and even the almost inarticulate judgment of an experienced man is, after all, more trustworthy than the precise figures which might be given in an account of individual examples. In agricultural questions, where everything is so dependent on circumstances, I would rather have the round numbers of a generally observant practical man than the decimals to the third and fourth place of an enthusiast on any particular point. And I think the body of testimony from which I have now read specimens is conclusive of the fact of agricultural progress. I should like, however, to add one reference to a particular example. If our Chairman can say that during his management of the Greenwich Hospital Estates £100,000 had been spent in land improvements, and many hundreds of cottages have been built, and largely increased rents have been obtained, and the tenants are in better circumstances, and the land is more productive, so that every class connected with it is benefited—so also can many an owner of land in the south. I will particularly mention the Sarsden estate in Oxfordshire, because it enables me to pay a tribute to the memory of one in whom English agriculture has lately lost a public-spirited exemplar and energetic friend.

During the late Mr. Langston's ownership of Sarsden—an estate of small extent compared with those of the Greenwich Hospital—£60,000 or £70,000 had been spent in the various estate improvements, which include the soil and its live stock, its roads, fences, buildings, farm-houses, cottages, and school-rooms. No part of the interests of landowner, tenant farmer, or labourer had been neglected. And the result is seen here, as in a multitude of other less definite examples throughout the country, in greater produce and a better-conditioned agricultural population.

Causes of Agricultural Progress.

Admitting, then, as proved, the increased produce of the country, what, let me ask, has it been owing to; and first, not of the original, but of the immediate causes of it.

1. It has been owing first to better tillage. The object of tillage is the creation of an increased available surface within the soil, on which may be prepared and deposited food for plants, and over which the roots of plants may feed. The greater the quantity of this internal superficies to act as a laboratory, as a warehouse, as a pasturage, and the better stored it is, under a given extent of land, then so long as the fitness of the mechanical condition of the land with reference to particular plants is preserved, the more fertile is that land with reference to those plants.

In order to the creation of this inner surface a greater depth of soil is stirred, and clods are comminuted. In order to the increased accessibility of this inner surface land is drained. The air and rain water which then traverse soil and subsoil instead of merely lodging in them introduce substances into this warehouse and activity into this laboratory.

The air which rain-water thus draws through the soil as it sinks downwards to the drains is as necessary to the fertility of the soil as it is to the heat of burning coals. The fire will merely smoulder until, by the erection of a chimney over it, a current upwards through the burning mass is impressed upon the air. And even then, in fires of caking coal, the heap may smoulder until, by the smashing of the fuel, that inner surface of the fire, where the action of the air takes place throughout it, is multiplied, and the impervious ceiling—or floor, as we might call it, to an upward current—which has hindered the passage of the air over that inner surface, is broken up.

Land drainage is the provision of a passage for the rain water, along with which the fertilising air has thus a downward current given it through the soil and subsoil. And tillage, especially tillage by steam-power, which does not cake a floor, as horse-power does, beneath the soil it stirs—has all that enlivening effect of the poker on a caked coal fire, which the parallel suggests. Extended drainage has a great deal to do with our increased produce. Mr. Bailey Denton estimates that nearly 2,000,000 acres have within the past 15 years been under-drained, and the fertility of these acres has no doubt been largely increased.

Deeper and better tillage has contributed to the same result. The extension of autumnal tillage is an undoubted fact; the enormously increased use of implements of the grubber class is another; the general adoption of a better form of plough is a third; the more general adoption of the fertilising practice of burning clay soils is a fourth. The success which has at length rewarded unconquerable perseverance in the attempt to use steam-power for tillage operations, is another great fact, which, if it cannot yet be quoted in explanation of agricultural progress hitherto, will unquestionably be looked back upon 10 years hence as having contributed largely to the increased fertility which will then have to be recorded.

2. In the second place our agricultural progress has been owing to the greater richness of home made manures, and to the greater use made of imported fertilisers. The imports of guano since 1840 have amounted to $3\frac{1}{4}$ millions of tons; the imports of cubic nitre, which averaged 10,000 to 14,000 tons per annum up to 1858, have since varied from 25,000 to 40,000 tons per annum. The imports of bones since 1848 have increased from 30,000 to 70,000 or 80,000 tons annually. All these are manuring substances. Dr. Voelcker informs me that 75,000 to 80,000 tons of Suffolk and Cambridgeshire coprolites, and 15,000 to 20,000 tons of Sombrero phosphate, are also used in the superphosphate manufacture, which now probably exceeds in worth £1,000,000 per annum. To facts like this we have to add the enormous extension in the use of oil cakes and richer foods in the meat manufacture, by which the richness of home made manure is increased. The increased adoption of the practice of applying manure at once to the land, instead of rotting it in heaps, is an economy, and so an addition to our resources worth naming. The increased practice of feeding and collecting manure under shelter is another economy. The increased care to properly pulverise and even dissolve manures, so as to distribute them thoroughly through the soil, is another first-class example of a most important improvement in farm practice. On the other hand we have to confess the increased value of the town sewage, due to the improved drainage of our towns—which is still suffered to go to waste. On the whole, however, there cannot be a doubt that the increased fertility of the soil is due not only to improved drainage and tillage, but to the direct application of fertilising ingredients in a more liberal and economical manner.

3. Leaving now the soil, we have the way in which its increased fertility is developed and expressed. I suppose in the first place it will on the whole be admitted that, at least on arable lands, there are fewer weeds; our fallow crops are cleaner, our tillage and manures are not wasted so much on plants we do not want to grow. That is the first fact, as I believe it to be, under this head.

Another is the prevalence of rotations of crops in which bare fallows are diminished, and in which there is a larger acreage of the more valuable crops. The prevalent rotation of the country is the four-field course, in which wheat, turnips, barley, and clover occupy one-fourth of the land apiece. But it is common on well cultivated land—where the land is folded by cake-fed sheep, and where a top dressing of guano is given to the corn, to take a crop of wheat between the turnips and the barley, so that three-fifths instead of two quarters of the land are in grain crops. One half of the clover land, too, is often sown instead with peas or beans, so that five-eighths instead of three fifths are in grain. Again over large districts, especially in Scotland, potatoe culture does to a great extent displace turnips or other fallow crops, and this provides a great increase of food for man.

But besides the adoption of improved rotations, we have to report the improved cultivation of individual crops. I suppose that the gradually diminished quantity

of seed used per acre in growing grain crops—as drill husbandry extends, and as an increased independence of mere custom becomes the rule, each man determining his practice for himself—will be admitted by most people as an example of this kind. Certainly every one will admit that the extension of drill husbandry in the cultivation of root crops, the extended use of the horse-hoe in the cultivation of grain crops—the extended use of so-called artificial manures as top-dressings and otherwise in the cultivation of all crops—all illustrate the improved cultivation of the plants by which the greater fertility of our soils is expressed and utilised.

Again, we owe our better crops to the selection and adoption of better sorts of the plants in cultivation. I do not suppose that individual sorts have improved upon our hands. Probably, as a general rule, they have deteriorated. But new sorts are being perpetually introduced, and of wheat, barley and oats, mangel wurzel, swedes, turnips and potatoes, cabbages, and vetches, a man can grow sorts as good as any—I think probably better than any—that his predecessors have known.

4. We now come to the produce of meat, and the question of sort has a great deal to do with our improvement here. There are probably fewer acres now devoted directly to the growth of cattle food than there ever have hitherto been. and though, notwithstanding this, I do not doubt that owing to liberal and vigorous cultivation we grow more tons of cattle food annually than ever, yet it is not so much to this as to our improved sorts of cattle, sheep, and pigs, that we owe our increased produce of animal food. Our sheep are now ready for the butcher at 14 months old; our cattle at 24 and 30 months. Formerly it needed at least two years of feeding to make a smaller carcase of mutton, and at least three or four years' feeding to make a smaller carcase of beef. A thousand sheep upon a farm in March or April now mean something like 500 ewes in the lambing fold, and 500 sheep ready for the market. Formerly they meant not more than 300, and those a smaller lot ready for the butcher. And this great increase in the meat produce of a given head of stock is witnessed as much in pork and beef as it is in mutton.

All the important breeds of cattle, sheep, and pigs have improved and increased in numbers during this period. Mr. Strafford receives entries for his herd book from four-fold the number of short-horn breeders, and the influence of this, the dominant breed of cattle, in crossing the general stock of the country has wonderfully increased. Messrs. Duckham and Tanner Davy report no falling off in the number and quality of the more local breeds of Hereford and Devon. Both Down and long-woolled sheep, and especially the latter, have made great strides, both as to increase of numbers and general improvement; and much more general interest is taken in the improvement of the breeds of swine. The public attention has lately been drawn, or rather driven, to the fact that disease is rife among our stock, and it is said to be increasing. It is one part of our evidence for the fact of great agricultural improvement that an evil of this kind, whether general or local, and wherever it exists, is not now left to fester, but exposed and probed by an energetic public agitation, which will undoubtedly promote its cure.

The greater rapidity of growth, and the increased size of our improved stock, both well illustrated by Mr. Herbert's figures, in the *Royal Agricultural Society's Journal*, which describe the supplies to the metropolitan market, are owing partly to the better food we give our stock, as well as to their increased precocity, and the enormous extension of better bred stock. And thus, as part of this experience, we have a supply of more fertilising manure and an increased growth of grain crops. It is, I believe, the fact that there are more acres of corn grown now than ever has before been known in England, and I look upon this as a proof of agricultural progress. And, so long as this is consistent with the maintenance of fertility, it is certainly for the interests of the consumer. It is said our climate is especially favourable for the growth of green crops. I believe we grow more bushels of wheat per acre than any other country, whether we have so good a climate for it or not. And if the present extravagant cry for laying land down to grass which has hitherto grown grain and green crops in alternate husbandry shall to any extent prevail, I do not know who is to benefit by the change. Landlord, tenant, labourer, and consumer, are alike interested in the larger produce and more energetic cultivation of arable land.

The progress which I have thus sketched has been achieved rather by the extension of good agriculture than by the invention of any new process during the period of it; and yet there is enough of novelty and change apparent, too, on comparing the farmer now with his predecessor then. Bones and rape-cake, soot and salt and gypsum, lime and marl, and composts used to be the principal methods of adding directly to fertility; and indirectly the same end was attained by the cultivation of successive green crops, feeding rye and rape, vetches and turnips, and cabbages off successively upon the same field. This "double" culture was advocated confidently as the perfection of arable cultivation 28 or 30 years ago. Hear Mr. Middleton, who edited the 20th edition of Arthur Young's Farmer's Calendar, writing on this very practice. "That very numerous class of supine persons," he says, "whose minds are so weak as not to adopt this practice, which is the most improved that is known, will certainly continue to complain of hard landlords and bad times. Such characters do not succeed in any profession; neither can they in agriculture. I had nearly said they deserve to be poor, but, whether they deserve it or not, their destiny is to be so."

Notwithstanding, however, Mr. Middleton's vigorous assertion of this practice, it is not thus that the farmer now in general seeks the increased fertility of his lands. He has guano, superphosphate, and other fertilisers at his command. He has machinery, not only for the increased efficiency, but for the cheapening of all agricultural processes. Steam-power both tills the soil and threshes out its produce. The mowing machine, hay-tedder, and reaper—the chaffcutter, pulper, and steamer—cheapen the labour of securing his crops, and economise the after use of them. Better plants are grown, and better animals are fed, and the fertility which came with profit under the best management in two or three years, is now achieved, perhaps with no greater profit, but almost at once.

But I believe that I have sufficiently illustrated the fact of agricultural progress. Let me now enumerate some of the helps and hindrances amidst which it has been accomplished.

Helps and Hindrances to Progress.

The original purpose of this paper was to bring into the brightest light that I could strike, the share which agricultural societies have had in promoting the progress which has been now described—the influence of farmers' clubs, of local provincial and national agricultural associations—and in what way it could be wielded more efficiently. To this end I have entered into correspondence with the secretaries of these societies; and learning from them the nature of the efforts and achievements which have thus in many places been witnessed, it is impossible to doubt that these societies have been of service in the promotion of good cultivation, both by the stimulating influence of the competition which they have excited, and also (though this is not so uniformly true) by the guiding influence of the awards that they have made. And in previously backward and secluded localities, especially where railroads and access to new markets have happened together with the establishment of the local society or club, great agricultural improvement has unquestionably been accomplished. It is, however, I believe, also unquestionable, that after all the society plays a subordinate and merely incidental part. The real stimulant to agricultural improvement is the self-interest of the land-owner

—the self-interest of the tenant farmer—which is sharper, far more earnest, more genuine and trustworthy than any external spur or rein, such as societies do to some extent supply. And thus it is in the business relations of the farmer that we have the real limits and conditions under which his professional ability appears. The terms on which he has hired the machine, the factory, the mine, or whatever his farm may best be likened to—the relation in which he stands to the owner of it, and to the labourer by whom he is to work it—these are the real rein and spur by which his progress is at once urged and guided. For here, as in other professions, most men know a great deal more than they practise. It is not always ignorance which hinders progress, which societies with their exhibitions and discussions might remove. Self-interest does not urge them, or rather it is self-interest, after a wary consideration of their circumstances, which restrains them. And thus it is that first among the helps and hindrances upon our list stands the relation of landlord and tenant.

Relation of Landlord and Tenant.

All agricultural readers know that this has been the subject of very general discussion lately at agricultural meetings. A society in Suffolk has offered a prize for the best form of agreement between landlord and tenant; Lord Lichfield, in Staffordshire, has done the same; and the Vale of Evesham Agricultural Society has issued the result of its studies of the subject. The salient points of the discussion were perfectly brought out at one of the meetings in connection with Lord Lichfield's prize agreement. The Earl of Shrewsbury is reported to have spoken there as follows:—

"I hold that you cannot frame any agreement which can be binding everywhere, but you can do what I have done, namely endeavour to act fairly and honestly by those who live under you. I should be sorry, and I should feel it to be dishonest, if I allowed any tenant of mine to leave me in debt to him. I mean if a man put on to a farm that which would improve it, I should feel bound not to let that man leave my estate without being remunerated for what is unexhausted. That is the only fair principle that can be acted on. All other matters must be subjected to a give and take agreement. I am not averse to any good arrangement that can be made, at the same time I do not hold out any hope that I can make any change in my arrangements with my tenants. We have agreed well together so far, and I hope that we shall continue to do so. Where there is a desire on both sides to agree, we are not likely to fall out. I adhere to what I have always said respecting leases, namely, that nothing will induce me to give a man a lease, because in the first place a lease is all on one side. The landlord remains, but the tenant if he be inclined to be fraudulent may go. I boldly and honestly state I will never surrender my property to a tenant. I mean that no man who will allow his sons to poach and act disgracefully shall have control over my land for a number of years. I will have an agreement for the mutual benefit and protection of myself and the tenant, and if any agreement really better than the existing one can be found, I will adhere to it. I hope that my tenants will feel confidence in me and my successor, and that they will be content to lay out their money with a feeling of security."

I do not recollect anywhere to have read a clearer, more straightforward statement of what is, I believe, the prevalent feeling among owners of land. It would of course be little better than impertinence to say that Lord Shrewsbury has a perfect right to dictate the terms on which he will let his land—this everybody knows. At the same time everybody, I am sure, also knows and feels that his lordship cordially admits the public duty by which the theoretical omnipotence of ownership is practically limited. It is only as among the helps and hindrances to agricultural progress that we have any right to the discussion here of such opinions as he has expressed. The promotion of that progress, meaning, as it simply does, more food per acre, is what every public-spirited man will admit to be a public duty, and therefore it is clearly within the scope and object of this paper to consider the influence on agricultural progress of such a resolution as Lord Shrewsbury has expressed.

I am not going to weary you with the oft-repeated and irrefutable argument in favour of leases for a term of years as tending to increased fertility—to that increased outlay of capital in cultivation on which the productiveness of the land depends. But there are two or three points which Lord Shrewsbury's speech has mooted, on which as many short remarks may be made.

I ask then, first, with reference to leases—Is it true that the lease is all on one side?

On the contrary:—Put all the advantages on that side which it confers, it is the instrument which not only secures those advantages to the tenant, but which secures to the landlord the annual sum or rent at which he himself has valued them.

Again, with reference to tenancy-at-will, I ask—does the landlord "remain"? We all know that the word "changeable" applies to a man's will as well as to his person. The landlord does not remain, and his successor, whether he be the inheritor of his property, or himself in a different mood of mind, may in the case of a tenancy-at-will, arbitrarily put an end to an unwritten bargain.

Thirdly, as between leases and tenancy-at-will, Lord Shrewsbury says, "I will never surrender my land for a series of years to a tenant." Under tenancy-at-will, how- a tenant is asked to entrust his property in great measure, and I will say in *greater* measure, to his landlord. For it is much truer to say the land remains, than it is to say the landlord remains. I do not hesitate to say that in the case of well-cultivated land of average fertility, there is not under leasehold farming so much of the landlord's property per acre in the power of the tenant to injure or destroy, as in the case of tenancy-at-will there may be of the tenant's property per acre within the landlord's power to appropriate. A landlord may say, "I will never surrender my property to a tenant," but in point of fact he never does surrender his property to a tenant. The land remains—it cannot be destroyed. We hear from Baron Liebig of the exhaustion of the land—no such thing is known in practice. I do not suppose that in average circumstances what is practically known as "worn out" land is ever injured to the extent of two years' purchase. That is to say, a farm—and if it be held on lease, we must suppose the tenant to have been not only fraudulent but a fool—a farm which has been injured as much as such an one might do it, would be readily taken at the old rent, provided the new tenant had it the first two years for nothing. The injury which a fraudulent tenant can do—*provided he be also a fool*—may thus amount to £3 or £4 per acre. On the other hand, taking the case of a man farming land as it may be profitably farmed (in the manner which alone contributes to agricultural progress) where a large expenditure has been incurred perhaps in draining, certainly in liming, in burning, in boning, in marling, in artificial manures, and oilcake and other purchased food for cattle and for sheep, all of which require time to realise their effect upon fertility, and I say the landlord has more than £3 or £4 per acre of the tenant's property within his power.

"Well!" it may be rejoined, "it is the object of this model farm agreement to graft on the system of tenancy-at-will such a bargain as shall ensure the repayment of these £3 or £4, or whatever the unexhausted outlay may be. Lord Shrewsbury proposes to adopt this, and the objection to which you have thus alluded—putting it in as personal a manner as possible—thus falls to the ground." There is not a chance within the hour of discussing the essential superiority of the lease for a term of years over any modification of tenancy-at-will, however bolstered up by these provisions for the repayment of unexhausted improvements. And, therefore, with reference to this rejoinder, I will only say that I cannot help the personal aspect in which the systems of lease and tenancy-at-will of necessity are regarded. It is the personal aspect which is the real one. Landlords, of course, inevitably entertain

the personal question first and foremost, and if obtruded on the one side it must be entertained upon the other. It is even less a tenant who will cross-crop and starve the land, than a tenant "who will permit his sons to poach and behave disgracefully," that is feared. After all it is the fear of having an ill-conditioned set of neighbours that is at the bottom of the dislike of leases. Experienced land-agents will tell you that it is altogether a mistake to apply general rules to the management of property. They say, "The majority of farmers don't want 'a field for the investment of capital,' as the phrase goes; they want an occupation and a home. Leases will not change the nature of a man; and, in fact, few things more obstruct agricultural progress than the system of dealing with farmers as a class (which they are not), instead of as individuals on their individual merits, which include as much variety as exists among any other body of their fellow-countrymen."

To this most people will, I think, agree; and in accordance with it one of the chief advantages I claim for leases is, that where adopted as a system greater individual care is taken in the admission of tenants on to an estate. And in accordance with it, too, one of the chief articles in the indictment against tenancy-at-will is that it is based upon a class treatment of the very kind which is thus condemned. It has, I believe, been proved in other walks of life that the plan of universal restriction—of treating all men with suspicion—of making your general arrangements hinge on the possibility that every man is a rogue, is a blunder. It is an especial mistake in agriculture. For there is a certain class-colouring perceptible, as in other professions, so in farming, and tenant-farmers may be safely spoken of as a worthy and well-conditioned body of men. If, as is ludicrously feared, a general prevalence of the lease should displace the homely and neighbourly class with whom in English country districts one has so long enjoyably associated, by a set of energetic, ruthless, restless, money-making "sharps," the change would be lamentable indeed; but the fear is ludicrous. However many new men may be entering agriculture from other walks of life, it will always be that the bulk of farmers have been bred by farmers. And it is, I believe, an easier and a better thing to engraft upon the characteristic good qualities of the class, or rather (for they already exist) to foster there the intelligence and enterprise, and energy of commercial life, by adopting more generally a commercial view of the relations between landlord and tenant, than it will be to engraft a strict valuation and acknowledgment of tenant right upon the system of tenancy-at-will.

I am aware that this subject has thus been barely touched—that in order to the full discussion of the influence of the well-drawn lease on farm practice—the great body of experience relating to it both in agriculture and in other businesses ought to be at least alluded to—that in particular those conditions of the lease which limit the power of the tenant to use his own judgment and intelligence and resources in the cultivation of the land; as well as those conditions which maintain, or define, or abandon the landlord's right, if he choose to exercise it, to preserve a live stock of his own upon the crops grown upon his land, should be discussed. The maintenance of an unlimited quantity of game upon the tenant's crops, consuming much that would be food for man and injuring the remainder, is of course fatal to agricultural progress, and has in many instances already proved so. And had there been time, it would have been my duty to put this fact with the others which are dealt with in a well-drawn lease as clearly as possible before the readers of this paper. Failing opportunity for this, however, I am very glad that if the relations of landlord and tenant should be the subject matter of the discussion which will ensue, we have, as Chairman, one enabled to "moderate" in such a discussion by a long and useful experience of the influence of a liberal and well-drawn lease, not only upon the fertility of the land, but on the character of the tenantry and on the condition of the labourer.

The other business relations affecting agricultural progress are those existing between the farmer and his labourers. It would have been easy enough to show that agricultural labourers, still badly enough off in many districts, have largely shared in the advantages of recent agricultural progress. Wages are better—a good deal more is being done to the improvement of cottages—and day and evening schools are exerting an unquestionable influence. The good will and intelligence of the labourer, both of which have thus been increasing of late years, are also among the greatest helps to further progress—and this is especially true now that steam-power is being used everywhere—in the fallow field as well as in the barn and feeding house. I merely name this subject, however, and hasten on to consider the way in which agricultural societies have influenced and may further agricultural improvement.

Agricultural Societies.

To this subject, which should have been the main topic of my paper, I must now devote the remainder of the hour. There is, I believe, nothing in other professions corresponding to the Agricultural Society. There are no mutual improvement societies among those who supply us with our apparatus, or our means—agricultural machine makers, manure manufacturers, and seedsmen. Nor are there mutual improvement societies among those who deal with our results, as millers, brewers, bakers, and butchers. Every man among these, notwithstanding that for some special purposes, *e.g.*, mutual protection, they may unite, does the best he can for himself, and stands or falls by his own merit or demerit. This is of course also true of farmers. But the Agricultural Society, like many another feature of our profession, arising out of the peculiarity of its raw material—land, is as much a social as a strictly technical or professional institution; it deals with and affects a whole country side, and the whole population is interested in its proceedings. This is more especially true, however, of only one class of agricultural societies. There are several: and it is plain that it is only by a short reference to the classes under which the many hundred agricultural societies of this country may be arranged, that I can hope to illustrate my subject.

1. Proceeding from the ranks of the tenant farmer on either side of him, there are first the strictly farmers' clubs, meeting for periodical discussions of agricultural topics. They were once very much more numerous than they are now. Only a few have survived from the period of twenty years ago, when a great many were in activity. They have unquestionably been of great service in publishing agricultural information, in the direct introduction of improved practice into their respective neighbourhoods, and in establishing better business arrangements.

As to the publication of agricultural information. Their discussions, generally published in the county papers, and their annual reports distributed to members, are sure of being read by those to whom they are addressed, which is a great deal more than can be said of other agricultural publications. I have an immense mass of reports, through many successive years, from a great many of these clubs, and there is no better agricultural library—no more useful one, if only some means were devisable for indexing or arranging it.

We have a Central Farmers' Club in London distinguished for the great practical value of its monthly papers and discussions. I do not know that it claims anything more than geographical centrality. It would, however, be of great agricultural service, I believe, if it were also officially central with reference to these institutions, and if its library contained the annual reports of all the local societies, or if its secretary were the editor of them, so that an annual volume of selected papers might be prepared, to which more prominent influence might thus be given. A connection through some central officer in this

way would tend to the permanence of these local institutions. They are very shortlived, and this in various ways has been owing to their strictly local character.

These institutions have not only kept their members informed—they have often introduced new practices into their localities. The Morayshire Farmers' Club, established so long ago and thriving still, was, I believe, the first to call general attention to the value of superphosphate as a manure. And long before this (I believe early in this century) it had deputed the late Mr. Forsyth, its secretary, to visit Norfolk, and bring back agricultural information for its guidance. The Ayrshire Farmers' Club, by the adoption of similar means, appointing deputies to visit and report upon the dairy districts of England, has been the means of introducing the Cheddar cheese manufacture into its county. The business arrangements of their locality are also often most usefully guided by these societies. The erection of corn exchanges—the alteration of market arrangements, and the establishment of new markets, are among the subjects which are often thus regulated.

As an example of the great service done thus, I will quote a report from Mr. Wilson, of Edington Main, regarding the Union Farmers' Club, a Society embracing more than one county:—

"Its head-quarters are at Kelso; it is of long standing, and has had upon the whole a useful career. I would specially refer to the annual sale of Leicester rams, now of some dozen years standing, which was begun and is carried on under its auspices, and which has been a great success. It has tended most directly to the preservation, improvement, and wide dissemination of that truly valuable breed of sheep, the Border Leicester. For several years past about 2,000 shearling rams, chiefly of that breed, have been sold by auction at this annual Kelso ram fair, and have been widely dispersed over Scotland, Ireland, and the North of England. These rams are for the most part bought for crossing either with pure Cheviot ewes or with ewes of the first, second, or third cross from the Cheviot. These crosses are a truly valuable kind of sheep, and it is with them that the arable farms of Scotland are now chiefly stocked. This annual congregating of rams from the flocks of so many different breeders, and the sale of them by auction at the same time and place, both affords ample choice to customers, gives to the ram breeders the best opportunity of knowing exactly the kind of animal that is in demand, and brings them under the influence of a far more powerful stimulus to exert their utmost skill and care than any system of prizes for selected animals could do."

This is only one illustration of a whole class of public services rendered by local clubs.

It is impossible to enumerate even a tithe of the many local institutions which have been of immense local benefit in all these ways. In the North of England, the Newcastle and the Hexham and Penrith farmers' clubs have distinguished themselves by the valuable papers read at their meetings. The St. Quivox Farmers' Club, in Ayrshire, and the Wirrel Farmers' Club in Cheshire, and the Maidstone Club (Kent), have occasionally adopted the useful plan of going in a body to visit particular farms and localities. Others have instituted book societies for the loan or circulation of the leading agricultural works.

Among the defunct institutions of this kind, whose annual reports are full of useful information, I may mention Gloucester. Among the longest lived and still surviving, similarly distinguished, I may mention St. Austle, in Cornwall; and Framlingham, in Suffolk; and Wirrel, in Cheshire. Among the newer and more lately established farmers' clubs, which have also attained high merit in this way, I would name the Kingscote Farmers' Club in Gloucestershire.

I have an immense mass of local correspondence and reports from the officers of these institutions, which it is impossible to epitomise, but I hope to publish it piecemeal hereafter. A great help to this most useful body of societies would, as I have already said, be given by a central office, such as the Central Farmers' Club might be, through which every individual society would be kept in communication with all the others. The Society of Arts has thus inspirited and aroused all the Mechanics' Institutes of the country, and a similar service might be done to farmers' clubs in a similar way.

2. There is a second class of local agricultural associations, of which I can give no detailed account, simply from want of space and time. They have, however, I believe, exerted a very useful influence on agricultural improvement. Labourers' Friend Societies, as they are called, are scattered pretty thickly over England; their prizes for skill in the ploughman, shepherd, hedger, and thatcher, and so on, have unquestionably led to useful rivalry and great improvement in the ability of the agricultural labourer. If any one wants information on the services which such a society may render, he should apply to Mr. Clarke, of Long Sutton, Lincolnshire, who has long superintended the operations of a most efficient association of this kind. There is many a locality where both master and man have thus benefited, and where the improvement, and, still more, the desire for improvement thus implanted have directly furthered agricultural progress.

3. I could give many examples of this, but must hurry on to the third and most important class of all, including all those societies which act mainly by the annual show of implements and cattle exhibited in competition for premiums awarded by the Societies' judges. They are of all ranks, as to extent of the district to which they are confined and of the funds they administer. These societies have unquestionably been of great service to agricultural progress. They are useful in their social relations, as affording good-humoured gatherings of all classes with a common interest in view; and, professionally, they excite the rivalry and guide the judgment of those who exhibit stock or implements at them, and they confer commercial rank and afford commercial opportunities. The personal rivalry which they excite is as powerful an engine in the hands of the purely local societies as it is in those of greater pretensions; and there are in every locality now so many herds, and flocks, and manufactories, which send out specimens of first-class merit, that these local societies are also serviceable in the second way I named, by giving to spectators models of excellence for their professional guidance. That these local societies, which, with their sweepstakes and local prizes, have always been serviceable in stimulating the farmers of the district now stand so high as also affording examples of first-class excellence in every department of their shows is due, in great measure, to the influence of the greater and provincial societies, which, having a wider basis and more extensive district, have made merit in all these departments generally known when it was rarer. These provincial societies are now generally swallowing up the local ones. I think it is a pity that the local societies should disappear in this way. There is an almost domestic character about their annual meetings, by which a more personal influence is exerted on exhibitor and spectator—and a more wholesome influence is exerted on the relation of master and servant by the annual holiday thus spent together. And where these societies obtain the services of judges of well known character from a distance, their decisions are not only of great service, but they are accepted, and thus the feeling of angry disappointment which is sometimes felt by exhibitors at these local shows has little chance of development.

The county and provincial societies have latterly enormously grown, many of them distributing a thousand pounds in prizes at their annual shows. They attract large quantities of stock, and a sufficient company is drawn together to induce the manufacturers of implements not only of the locality, but from a distance, to expose their wares, whether there is any competition among them for prizes offered by the Society or not.

Most of these country societies meet annually in successive towns within their district, and the whole force of the exhibition and the company is thus brought to bear on different localities in turn. The provincial societies—

the Yorkshire and the Bath and West of England, which include either several counties or one as large as several, adopt, of course, with an increased effect, this principle of directing the whole force of a province on successive points within it. The latter of these Societies, which has other objects beside the strictly agricultural object, and thus can more directly claim the cordial sympathy of the Society of Arts than any of them, has by adopting this very principle lately taken a new lease of life. Invigorating, and being invigorated by the several districts which it visits, it has grown in all the departments of its show to the very highest rank of excellence and influence. I refer to it especially, because it has soonest of any of these great societies seen that the agricultural machine department has outgrown in many ways the power of the society to exercise with any good effect either the guiding or the stimulating influence which prizes have hitherto exercised. The Bath and West of England give no prizes, but merely room and opportunity to exhibitors of implements; and the usefulness of this department of their show has not in any way diminished.

The great national societies by which the stock of every breeder and the machines of every manufacturer are made known at the annual show to buyers of all counties and of all countries, and by which the agricultural force of the whole nation is discharged upon one province after another, as the great association makes its annual step from one point to another in the course of its journey once in 12 or 15 years around them all—these are the last agency of this class for agricultural improvement to which I shall refer; and, confining myself to the Royal Agricultural Society of England, although I do not think it necessary to enumerate the many proofs which exist of its usefulness, as seen in the multiplication of good herds and flocks, in the increased activity of the provincial societies in the districts it has visited, in the improved agriculture especially of the more secluded of these localities, and in the general extension and adoption of improved implements, yet no one is more thoroughly convinced than I am of the great national service that it has rendered in all these ways. I will quote but one slight but (as it is definite and local) striking illustration of the kind of good which in one of these ways it has done, simply because it is just to that one way that I purpose to confine the rest of my remarks on its management.

In a very interesting report by Mr. Jefferson, of Whitehaven, on the proceedings of the West Cumberland Agricultural Society, he says "Thanks to the Royal Agricultural Society's holding their meeting at Carlisle, I believe that exhibition was instrumental in opening the eyes of many of our Cumberland mechanics. Previous to 1855, our county was wont to boast of her ploughmen, but when it came to the test at Carlisle, we were well beaten upon our own soil; not that our ploughmen were deficient in skill, but they had not the implements to work with."

It is to the implement department of the English Agricultural Society—to the prize system as carried out in its annual shows, and to the influence of it upon the agricultural machine department, that I shall now confine myself. And during the few minutes which remain to me, I shall endeavour to state the reasons for which I believe that the prize system, as applied to the machinery department of the show, is a failure.

The awards of the Judges are made after insufficient trial. During July, which is the usual month of meeting, the state of the soil and of the crops upon it is not adapted for the trial of whole classes of machines; and even if it were, the time allowed the judges for arriving at their conclusion is with reference to many machines altogether inadequate: and I believe that the Society would both guide and stimulate manufacturers better by appointing judges to report at leisure on the experience of localities respecting this, that, and the other machine, than it does at present, by submitting all, in a sort of scramble, before half-a-dozen judges on one spot. Then, again, the award of a prize confers too great, *i.e.* too abrupt, a distinction. As regards many machines whose work cannot be expressed or represented by numbers—the plough for example—the prizeman wins, the rest are nowhere. There never probably was a more marked example of this than at the Warwick show, where a new man appeared as ploughwright, and took many of the principal prizes. His plough, a good and well-made tool, as all of Messrs. Hornsby's manufacture are, pressed the furrow slice tighter home, and left a higher crest than the others. Its work gratified the eye—the judges pronounced it best—and their decision was an altogether excessive advantage given to the firm.

No doubt a tightly-laid furrow slice is, for some purposes, advantageous, but all the tendency of late has been to regard tillage as a smashing up; and where the land tilled lies on a drained subsoil, the rougher the surface is the better for its future tilth. But it is an illustration of the excessive character of the prize system that, whereas the decision at Warwick placed Messrs. Hornsby on a pedestal while Messrs. Howard and Ransome, and others, were, so far as the Society was concerned, in the case of that particular competition, nowhere, I do not suppose there are ten practical tillage farmers who will say that it matters one penny per acre per annum whether Hornsby's, or Howard's, or Ransomes' plough is adopted as the implement of the farm. Yet, still, year after year, ploughs are pitted against each other as if some new form of the tool were yet to be forthcoming, or as if three men, clever as they may be, could in a few hours' trial, fish out the microscopic differences which may exist. The whole thing has now dwindled to a mere ploughing match, and the firm that can tempt the cleverest ploughman to its service wins the day.

Although, however, to the extent of their value, the distinctions awarded at these shows are excessively abrupt, as well as liable to error from inadequate previous trial; and although, no doubt, originally, the award of a prize, during the earlier years of the Society's proceedings, was a great advantage to the winning firm, yet it is proof of the unfitness of this system to the existing state of the manufacture that it has now little influence on sales. This can be shown by examples, both of commercial success without prizes, and of failures notwithstanding prizes. To give names would be invidious, and I will, therefore, merely say that I know of a tillage implement which for years obtained a sale of thousands, before the Society's judges would consent to give it a trial. At length, for two years it was placed first, but the manufacturer declares that no impetus was given to the sale of it by these awards, while, in a subsequent year, after a rival had distanced it in the show-yard, the orders received for the tool were unusually numerous—400 more than could be executed. Again, I know a whole class of tools which for years were demanded, and patronised, and at length rewarded by the Society's judges, but they have never come into use. For these machines one maker received six prizes, and never sold one; one indeed he parted with, but it was very soon returned to him as useless.

I could name to you firms which have repeatedly received first prizes for another whole class of implements, who have never succeeded in gaining the public patronage, although they have had that of the judges, while others, who took hardly any of the prizes, have, nevertheless, taken all the orders.

Lastly, I could name an example in which a firm lost its trade in a particular tool by anxiously following the leading of the judges, regaining it, however, as soon as they resolved to depend on themselves. Making 700 or 800 implements of the kind annually, and taking prizes perpetually, yet following the lead of the judges, complaints from customers increased, and trade diminished year by year, until, from 700 sold each year, the sales dropped to 50. At length the manufacturer called his men together, that they might consult in order to recover the art they had lost. "You have been bamboozled,"

he said, "out of your ability by following false leadership. Here is one of the old tools, made twenty years ago; copy it in every particular." "Ah! Mr. ———," said one of his customers shortly afterwards—one who had complained of a machine he had previously bought,—"this one answers perfectly; you have learned at length to make the tool work." He had but retraced the steps of twenty years' false leading. This may seem a one-sided and extravagant illustration of my point. Unfortunately, it is a true one.

The trials are inadequate. There is a false advantage given to mere novelty—the prizes are in effect a premium upon mere speed and capability of standing a short race—on all these grounds it is improbable that the awards can be trustworthy. The prizes are too abrupt a distinction, and yet their influence on the trade is small, and both of these facts indicate that the time has arrived when, with reference to the implement department of the show, the prize system should be abandoned. There is one further consideration affecting the implement trade generally to be urged against it. It adds considerably to the cost of agricultural machines. One firm says it has spent £30,000 during the Society's meetings up till now, in preparing and exhibiting for prizes. Another estimates its expenditure at £20,000; a third says the disorganisation of the work—the spoiling of the best men, and the actual expenditure are together past estimate. Who has paid these large sums? Not these firms, but their customers. The cost of a machine is made up of the material it is made of, the labour spent on it, and a whole class of items which come under the general designation of waste charges. These waste charges amount to no less than 30 per cent. of the selling price, and the expenditure at the Agricultural Society's shows is a principal one of them.

There need be no fear that the shows would dwindle though prizes were abandoned. The manufacturers will not lose the chance of so good an advertisement and market as these shows afford. In fact, though protesting against the prize system, yet they will endure it rather than give up the show, and many of them who protested some years ago and refused to exhibit, are, nevertheless, coming round again. Commercial success, which hinges on the efficiency of the machines made, is a sufficient stimulant to the manufacturers; and if the Society think that they can usefully guide the manufacture, let them appoint judges as heretofore, not to award prizes, but to make suggestions and reports. The exhibition may be as much under the control of the Society as hitherto, and the opportunities given to the exhibition for showing their tools and implements at work, may be as completely arranged as hitherto.

In the quadrennial division of the exhibition which is now adopted, there is a certain confession on the part of the Society of some of the evils attending their present plan. I believe their influence would be as useful and as reat if they were to abandon it altogether.

But I have exceeded my time, and therefore I now leave this subject, and shall conclude with a short reference to the other branch of the general subject of helps to agricultural progress, coming to it through one mention more of the class of small local societies named at first.

Agricultural Education.

It is to the credit of a local farmers' club, that the only agricultural college in Great Britain originated in a paper read by one of its members.

The late Mr. Robert Brown, of Cirencester, read a paper, some twenty years ago, before the Fairford Farmers' Club, recommending systematic education for the farmer, and urging the establishment of a public agricultural school. Armed with the approving resolution of this Society, he aroused the gentry of the neighbourhood and county, obtained the support of public men and the patronage of the Prince Consort, and ultimately succeeded in raising a fund sufficient for the erection of the college buildings. The shareholders are incorporated by royal charter, and the institution, saved at one time by the public spirit of Mr. Holland, of Dumbleton, has continued, with varying prosperity, to impart an education in which the theory and practice of agriculture are combined.

The importance of the systematic education which is to be acquired as a whole at Cirencester, and piecemeal elsewhere, is the last consideration affecting the progress of agriculture to which I shall refer. Ours can be no exception to the rule of all other professions. There are great public schools of divinity, medicine, and law, and as the future rank of the individuals who have passed through them, so the status, from time to time, of the professions themselves, connected with each, depends on the efficiency and thoroughness of the professional education acquired. Agriculture, which deals with a larger capital, and provides a larger annual income than any other profession, ought to support and be supported by its schools. And I believe it is within the scope of our agricultural societies to attend to this. So directly was this seen by the promoters of the Royal Agricultural Society of England, than one of the ten objects for which its royal charter of incorporation declared it to have been founded was, "to take measures for the improvement of the education of those who depend upon the cultivation of the soil for their support." I have been a member of the Society from the year of its formation, and I submit to those who are responsible for its guidance that, from that year to this, nothing has yet been done by it in discharge of that particular duty which it then assumed.

It seems probable that the reason why comparatively little success has hitherto attended schemes of agricultural education is that the practical element has been in efficiently attended to. Certainly, no man is perfectly taught until he has acquired a practical knowledge of his business. There cannot be a doubt, I will not say of the absolute need of the practical part of agricultural education, but of its being the element which alone makes the education agricultural. The physiologist, the chemist, and the botanist, already have a knowledge of the general laws which include all the facts and phenomena of agriculture, but though any one combined the knowledge of them all, he would not therefore be an agriculturist. None of them could make a living off a farm unless he also possessed a knowledge of farm practice, and therefore it is that no school or college will be ever trusted, or have any claim to be considered as an agricultural school or college, unless the practical teaching is regarded as the aim and end of the institution.

One is perfectly willing to admit, nevertheless, that agricultural progress depends in great measure on that general intelligence and scientific knowledge which includes the theory of agriculture. The scientific and the practical man really are and ought to feel themselves allies, as much so as the geographer and traveller. The one knows the map, the other has a knowledge of the country. The one knows the several bearings of the route—the other knows the difficulties of the way. To be a successful traveller needs indeed the tact, and skill, and courage, of the practical man, but it also needs the previous knowledge of the geographer and man of science. And agricultural improvement regarded as a progress is necessarily guided by the great landmarks of scientific truth; and a general knowledge of the facts and doctrines by which these landmarks are established must tend to its promotion.

It is to the credit of the Society of Arts that this subject, notwithstanding the many to which its attention is more particularly directed, has not been neglected by it. Its annual educational examinations include Agriculture among their subjects. The Highland and Agricultural Society of Scotland, too, confers its diploma after an annual examination in the sciences and practice of agriculture by a board of professors and practical farmers. The Agricultural Society of England, originally committed by its charter to direct action on this subject, has hitherto been inactive.

In Conclusion,

It only remains for me now to thank you for the patience with which you have listened to my long and tedious story. Its large subject has necessarily been very inadequately treated. The lease as giving the tenant security for his capital—provided (unlike many taken out of the dusty pigeon holes of an office) it also gives him liberty for the exercise of his intelligence—and the agricultural college for imparting a sound practical and scientific professional education: These are the great helps to agricultural progress. Agricultural Societies are also a great stimulant and help; but their chief use and merit is in having interested the landowners of the country in agricultural pursuits, for agricultural progress depends quite as much on good landowning as it does on good farming. Good service is done, I believe, to agricultural progress by the attraction of educated and wealthy men to agricultural pursuits. One word more, therefore, on the merits and advantages of the profession. We all know the general attractiveness of a country life; to this have to be added the more specific professional advantages of the art and business of agriculture. I do not claim for it a very lucrative or money-making character, but it is a maintenance and livelihood, and it has that, besides, which is more than money's worth. I believe there is in its intelligent prosecution more than in that of any other profession, scope for the exercise and enjoyment of the whole nature of man. There is opportunity, during its prosecution, for the cordial, frank and independent exercise of all the social relations. Landlords, tenantry, and labourers are generally a well-conditioned company. There is, certainly, opportunity in its superintendence for the profitable exercise and trial of most of the moral attributes. Temper, resolution, patience and perseverance are tried in agricultural experience, and receive in it their appropriate reward. There is ample intellectual scope amidst the subjects which it presses on our attention. The first intellects of the age have been engaged with enjoyment and success in agricultural research. The highest names in all the sciences—Boussingault and Liebig among chemists; Buckland, Murchison, and De la Beche, among geologists; —De Candolle, Lindley and Berkeley, among botanists have especially distinguished themselves in the agricultural relations of their several sciences. The farm is no mere field for dull routine; it is the platform on which the best minds of the day may well employ themselves. And I add, as holding, of course, a good place upon the list of agricultural privileges, that the physical enjoyments of a country life are no mean additions to its advantages. We can all of us, to some extent, at any rate, sympathise with the exclamation of the Arab scheik to Mr. Layard, as they went careering over the plain, then green with the first verdure, and enamelled with the first flowers of spring: "Oh, Bey! what else is there worth living for? What do the dwellers in towns know of true happiness—they have never seen grass or flowers. May God have pity on them!"

I ought, perhaps, to apologise for this somewhat wild ending of what has been intended as a sober statement of my subject, and I will, therefore, in a single sentence recall to your recollection the main object and purport of this paper. The general position which I wish to establish is that agricultural progress is principally dependent, first on the improvement of our means of agricultural education, and, secondly, on the soundness of the business relations in which the farmer is placed.

DISCUSSION.

Mr. H. Cole, C.B., said Mr. Morton had opened up a number of subjects, any one of which would take hours to discuss properly. The condition of the agricultural labourer, though not altogether omitted, held an inferior place in the paper. He was not about to take a sentimental view of the condition of the farm-labourer; but there was one question which struck him forcibly, namely, the present condition of the labourer's habitation; and, amidst the boasted progress of agriculture, he had never been able to understand the kind of economy which placed the habitation of the labourer lower than that of the horse, the cow, and the pig. Those possessing stock took the utmost pains to house it properly, whilst the labourer, in this respect, seemed to be left to shift for himself. He should therefore like, in the consideration of the relations of landlord and tenant, that this question of the labourer's home should also be discussed. The tenant farmer did not appear to recognise the folly of not having the labourer living close to him, as his horse did, and ready to do work when he was wanted, but allowed him to live miles off, so that he had to begin work with half the physical vigour taken out of him. There were brilliant examples where landlords did really look after their labourers' welfare, but he was afraid they were exceptions. This Society had recently offered prizes for good plans of cottages, to be built at a cost of £100 each, and he (Mr. Cole) did not wish to depreciate such a proceeding, but this did not touch the general question. When people began to see how much it was to their interest to build good cottages on their estates, they would do so, whether they got an adequate return in the way of rent or not. The question of the labourer's cottage was one which for nearly a century had puzzled political economists. Adam Smith, in his "Wealth of Nations," alluding to labourers' dwellings, said:—

> There is scarce a poor man in England of 40 years of age, I will venture to say, who has not in some part of his life felt himself most cruelly oppressed by this ill-contrived law of settlement.

Practical farmers would admit that Arthur Young knew something of this subject, and he had written as follows in his "Farmer's Letters."

> It is too much the interest of a parish, both landlords and tenants, to decrease the cottages in it, and, above all, to prevent their increase, so that in process of time, habitations are extremely difficult to be procured. There is no parish but had much rather that its young labourers would continue single; in that state they are not in danger of becoming chargeable, but when married the case alters; all obstructions are, therefore, thrown in the way of their marrying, and none more immediately than that of rendering it as difficult as possible for the men, when married, to procure a house to live in; and this conduct is so conducive to easing the rate, that it universally gives rise to an open war against cottages. How often do gentlemen who have possessions in a parish, when cottages come to sale, purchase them, and immediately rase them to the foundation, that they may never become the nests, as they are called, of beggars' brats! by which means their tenants are not so burdened in their rates, and their farms let better—for the rates are considered as much by their tenants as their rent. In this manner cottages are the perpetual objects of jealousy, the young inhabitants are prevented from marrying, and population is obstructed.

That was written about 80 years ago, and he would ask them whether that was an over-charged picture, as applicable to a great part of England at the present time. Then he would refer to another authority, well-known to most present, Mr. Samuel Sidney, who travelled through Lincolnshire eight or nine years ago; and what said he?—

> Next to our system of transferring land, our law of settlement is the greatest obstacle to the decent housing of our peasantry, as well as to the due cultivation of the land. Our labouring classes can never enjoy the full advantages which the railway system offers for equalising the demand for labour until the laws are modified, which made parish officers see in every strong-backed hind the father of a race of claimants for board and lodging at the expense of the union.

That sentiment (continued Mr. Cole) was, to a great extent, still maintained. He supposed it would be at once conceded that the labourer could not build cottages for himself. The tenant farmer would not build them. The landlord would build them if he was a sensible man, but in too many cases the labourer did not get such a cot-

tage as decency required him to have. The law interposed, for the sake of the health of the population, in mines and factories, and caused parishes to pay for the maintenance and cure of people who contracted illness through defective sanitary arrangements in their houses, but it did not interpose to cause those habitations to be what they ought to be. The law said people might be housed and fed at the parish expense, but did not provide a cure for evils which everybody must admit to exist. Whilst the dwellings of the labourer were allowed to remain in their present condition all education was neutralized, and all attempts to raise the condition of this class were thrown away. He hoped what he had said—not being himself an agriculturist—would be taken in good part, and that efforts would be made to try and find out how this great and acknowledged evil was to be remedied.

Mr. Harry Chester said, though he agreed with Mr. Cole as to the importance of this question of the labourer's home, he, nevertheless, regretted he had brought it forward on this occasion; and still more, that he had made it somewhat a matter of complaint against Mr. Morton that he had not given sufficient prominence to it in his paper. Mr. Morton, like all other well-informed and right-minded men, no doubt felt as strongly as Mr. Cole did on this subject; but it was Mr. Morton's object to bring before an audience, composed principally of agriculturists, certain branches of the great agricultural question; and to have brought forward a subject of so much importance as the condition of the labourer's habitation, in a corner of a paper embracing so many subjects, would, in his opinion, have done little good. If, however, Mr. Cole would, on a future occasion, bring the subject prominently before the Society, he was sure he would do it justice, and they would all be glad to hear him. He was sorry to hear Mr. Cole use what seemed to be a mere rhetorical argument, when he compared the condition of the agricultural labourer to that of the pig, for there was this great difference between them: the latter was the absolute property of the owner of the land, but the labourer was not, and never would be in this country. Two principal subjects had been brought before them for discussion by Mr. Morton, one was, agricultural education; the other, the relations between landlord and tenant. It had also been suggested that the different farmers' clubs and other local agricultural societies should be connected with the Central Farmers' Club in London, and that a "union" might be formed, somewhat similar to that of the institutions connected with the Society of Arts. He would only say that if Mr. Morton thought the experience of the Society could be made available in furtherance of this object, he was sure it would be delighted to give its assistance; and having himself taken great interest in the original establishment of the Society's Union of Institutions, he should be happy if his experience in the matter would be of any use.

Col. Challoner said no one could entertain a higher opinion than he did of the paper read this evening, but he begged to differ from Mr. Morton upon one point in it. He should be sorry it should go forth as the opinion of this Society, that the giving of prizes by the Royal Agricultural Society for implements had not been beneficial to the progress of agriculture. No one had watched the advances made in the agricultural implement department with more care than Mr. Morton; and that gentleman was aware that at the first meeting of the Royal Agricultural Society, at Oxford, the number of implements exhibited was considerably under 150, and they were all of the coarsest description of manufacture. He asked what had brought the implements of England to the perfection in which they were at the present time? He submitted it was owing to the system of prizes adopted by the Royal Agricultural Society. He had been brought to this conclusion from his observations as a member of the Implement Committee of that society. Let them compare the position of implement-makers now and twenty years ago. The progress had been enormous, and he thought that, without the prize system, the manufacturers would not have been guided to the production of the class of implements really required. There were well known names who had made a high reputation everywhere, and it would perhaps be very agreeable for those gentlemen to rest upon their laurels, with the knowledge that everybody would buy their implements; but what was to become of the humble implement maker—the man of small means? He had no chance of competing against those great men, except by the help of the prize system. It was the great object of the Royal Agricultural Society to bring forward rising talent; and he hoped his friend Mr. Morton would excuse his differing in opinion from him on this subject of prizes for implements.

Mr. John Fowler remarked that he stood in the position of a very successful exhibitor of agricultural implements, as far as prizes were concerned, and had never failed in obtaining the prize he competed for; at the same time, he thoroughly endorsed every word that Mr. Morton had said with regard to the prize system. He had many times been placed in an unduly prominent position by a prize—a position he had no right to at the time; and if the prize system were continued, it might be he should be placed in a position he had no right to the other way. With respect to the present system of awarding prizes by the Royal Agricultural Society, it was known to be a mere scramble, for there were often hurried and imperfect trials; but if, instead of this, a well considered report was made of agricultural experience with regard to any particular implement, this would be of real value. In the first place they must look at the circumstances under which the trials of implements were now made. The expense for land for this purpose at Leeds was £800, and the cost of 100 acres of land at Newcastle next year would be £500. He had offered to subscribe another £250 in order that the trials might be made on a more extended scale. They could not respect a prize which was given upon a trial extending over only a few acres of land, and confined to one locality, which had features of soil and other circumstances peculiar to it. Col. Challoner had stated that the prize system had made the implement makers what they were. He (Mr. Fowler) would say it had not made him. If the Royal Agricultural Society, instead of spending £500 for land for the trials of implements next year, would spend that amount in a careful examination into the present results of steam cultivation upon farms in this country—no undue preference being given to any individual—very valuable practical results would be obtained; and in that respect Mr. Morton's writings in the *Gardener's Chronicle* had been infinitely more valuable to him than all the prizes he had ever received. He was therefore opposed to the continuation of the prize system for agricultural implements, and he would prefer to see well-digested reports upon their merits as the result of test and experience in various localities.

Mr. E. Holland, M.P., said, all those great improvements to which Mr. Morton had alluded could not be carried on by the tenant-farmer alone, but were more or less associated with the landlord and the labourer. There were formerly points in connection with the state of society which militated against every advance in agriculture, for at that time a tenant was more readily accepted by a landlord on account of his politics than his powers of farming. The labourer also was at that period in a far more wretched condition than at present. From the days of Elizabeth up to the time when the new Poor Law came into operation, the condition of the labourer had been gradually deteriorating; and the present Poor-law system was adopted as a remedy for a far worse system. Now-a-days a tenant was chosen because he understood his business and had capital to carry it on, and in proportion as the tenant improved in capital, intelligence, and experience, so would the condition of the labourer be improved. There was nothing of late years which had had so much influence

upon all connected with agriculture as the introduction of steam ploughing. Agriculture in this country had an enormous task thrown upon it. Allowing for emigration and deaths, the annual increase of population was immense. Besides this, the wants of civilisation must be met; houses, railways, and land for domestic purposes were required, the whole of which had to be taken out of the area which produced food for the people. But the steam-plough had been introduced, and the farmer discovered that by going more deeply into the land he could produce more food, and more or less keep pace with the increasing wants of society. This would not have been effected by the old class of tenant farmers. Men of capital and education were now taking their places, and the consequence was that they required a firmer hold upon the land than the man who had no capital and no education to direct the profitable employment of it—unless such men made a bargain with the landlord for the due security of the capital which they put into the land, it was not likely they would farm up to the wants of the present day. The consequence of this was, that the condition of the labourers was also raised, and though there might not be much in the matter of dress, yet he had found that on the adoption of steam culture, simply from being obliged to discard the smock frock and adopt a less cumbersome form of garment, the labourer had become a different man. The labourer must now wear an engineer's dress, and he became a different creature, and his social condition was also improved. Upon the subject of labourers' dwellings he agreed with much that had been said. He had recently found it necessary to build a good many cottages, the rent of which, to pay a fair interest upon the capital expended, would be £6 per annum, but the labourer could not afford to pay more than £4. He explained this to his tenants. There remained £2 per annum to repay him. This was arranged in the following manner:—The tenant, feeling the advantage he would gain by the improved condition of the labourer, agreed to pay half, while he, the landlord, consented to forego the other half. Thus, while the labourer only paid £4 in rent, he was able, by being on the spot, to come fresh to his work in the morning, instead of being wearied by a walk of several miles. Mr. Cole would thus see that in some instances, at least, landlords and tenants were not unmindful of the points he had raised. He could only say he felt much indebted to Mr. Morton for a paper which would tell, not merely in that room, but upon the agricultural world at large—so clear and straightforward had been all that had fallen from him this evening. He was sure farmers would feel convinced that in proportion as they employed their intellect and capital in enhancing the productiveness of the soil, so they became more valuable members of society.

Dr. Ellis thought the great improvements in agriculture during the last 20 years were mainly attributable to the improved implements employed in cultivation. These inventions had all tended to relieve man from the more arduous portions of labour as compared with the primitive modes of agriculture. Dr. Ellis referred to the effects upon the physical condition of the labourers who excelled in their localities in mowing and reaping, the great manual exertion required for those operations tending to cripple the frame at a premature period of life. Thrashing and ploughing by hand-labour were also referred to, as further instances of this; and so complete was the exhaustion of the physical energies by this arduous toil from early morning till evening, that there was little opportunity and less inclination on the part of the labourer for any efforts at mental improvement. Upon the subject of leases, Dr. Ellis stated his entire concurrence in the views expressed by Mr. Morton, and contended that unless satisfactory leases were granted to tenants neither the capital nor the intelligence necessary for successful farming would be employed in agriculture.

Mr. R. C. Ransome said, having been engaged for the last 16 or 17 years in the manufacture of agricultural implements, and having attended most of the exhibitions of the Royal Agricultural Society as the representative of his firm, he begged to state that all that had fallen from Mr. Morton condemnatory of the present prize system met with his fullest concurrence. He was quite sure it was not the temptation of the prizes that stimulated manufacturers to bring forward improved machinery, but the great and natural stimulus was the hope of ultimate profits from an extensive sale. With regard to the progress which agricultural machinery had made during the last 12 or 14 years, it must not be forgotten that railways had made the means of transit so much easier. The gold fields of Australia and California had been opened out, a large European population had emigrated to those regions who required to be supplied with food raised by the operations of agriculture, and these could not be carried on without the aid of machinery, which machinery could only be manufactured in England or America. Nor must it be forgotten that during that period England had become the grain market of the world, importing large quantities of corn and sending back gold for it, so that a greater demand for our machinery had been created in all the corn-growing countries of the world. These were more potent stimuli to the industry of the country than medals, diplomas, or any such trifling matters, and when he found that cottagers could gain prizes for their pigs against men who were able to feed 200 or 300 head of swine, and out of that number select the best, he would believe that the small wheelwright could beat the capitalist. He (Mr. Ransome) entirely repudiated the notions of Col. Challoner with respect to prizes on behalf of his own firm, and he believed he might do so on behalf of many other firms. It was the desire of the large implement maker to assist in bringing forward talent wherever it was found to exist, and to keep steadily on in the march of improvement, not resting upon his laurels, but always making further efforts.

Mr. Robert Smith endorsed the remarks of Colonel Challoner with respect to the value of the prize system to the fullest extent, and pointed to the state of agricultural implements, as well as to the position of the makers prior to the institution of the Royal Agricultural Society, in support of that view. It was the prize system of that society which brought together a large quantity of implements to be tested as to their merits. Allusion had been made to the Bath and West of England Agricultural Society having discontinued the system of prizes. Being himself a West-of-England man, he knew the history of that matter, and he believed it had been occasioned by undue dictation on the part of some members of that society, to whom the Council gave way, and the consequence was the prizes were discontinued; but he added that a lurking fondness for the system was manifested by exhibitors of implements at the shows, for they displayed in a corner of their stalls the medals that had been awarded to them. As a member of the Council of the Royal Agricultural Society, and having closely watched its working, he considered the decision to continue the prizes for implements a judicious one. Mr. Ransome had spoken of the trade in these implements which had sprung up with our colonies. He (Mr. Smith) quite granted that, but it was only after the implements had been improved and had become of established use in our own country.

Mr. Hammick (Assistant Government Commissioner for the Census) would say a word on a subject not alluded to in the paper—agricultural statistics. The advantage to all classes of the community, particularly to the agricultural portion of it, of organising a good system of agricultural statistics in this country had frequently been pointed out. Mr. Morton had referred to the testimonies of competent persons as to the extent of agricultural progress in this country, but had he been able to refer to figures instead of general statements from scattered

parts of the country, he believed still more satisfactory results would have been put before them. It was quite competent for them to have a similar system to that in Ireland, where the facts were collected and recorded by public officers, forming the basis of all deductions drawn as to the state of things in that country. It was a reflection upon them that whilst France, Belgium, and other continental nations had established a complete system of agricultural statistics, nothing had been done in that direction in this country. He quite believed with Mr. Henley that the fault did not lie with the farmers themselves, for he thought they would be quite willing to give the information if the Government provided proper persons to collect it. He hoped in the next session of Parliament this subject would be taken up in a way that its importance deserved.

The Chairman said he felt it would be wanting in respect to them, and to the great subject which had brought them together, were he not to express the satisfaction he had felt at hearing the very comprehensive paper which Mr. Morton had read—a paper which was in so many points instructive, and, in so many other points, suggestive of improvements which were to follow. Agriculture had been the occupation of his life, which had not been very short or very inactive, and he rejoiced to see the interest which was taken on this occasion by the large audience gathered before him, considering, as they must do, agriculture to be the most important branch of our national industry—inasmuch as we had to look to it for supplying the means of all human existence, and, without it, no other branch of industry could long be sustained. There were very few opinions expressed in the paper with which he did not entirely concur, but, from his own experience, he could not agree with what Mr. Morton had said, when he stated he believed there was less food for cattle raised in this country than at a former period. [Mr. Morton—Less acreage devoted to it.] His experience led him to think otherwise. In many of the mountainous districts, the facility given for the production of root crops, by the introduction of portable manures, had gone far to increase the cultivation of green crops. The system of thorough draining and deeper cultivation had brought a great proportion of land into a condition to grow wheat crops, which 40 years ago was thought only fit for a naked fallow, and would only produce a scanty crop of wheat. In this respect he was a little surprised to hear what Mr. Morton—no doubt from his experience and facts gained in other parts of the country—believed to be correct. The introduction of the portable manures had undoubtedly had great effect in extending the growth of turnips, and it was the superior cultivation of the land, by drawing from it much greater produce, and by the improvement of the various descriptions of crops, which had caused the great increase in the production of human food. One of the first things a farmer had to do was to exercise his judgment in the description of stock to which the climate and the soil in which he was located were suited, and then to bring that stock to the greatest perfection. They knew that large short-horn cattle and large sheep would be destructive to the farmer having poor land; therefore it was upon the exercise of his judgment in that respect that his success depended. Something had been said with respect to the difference between leases and tenants-at-will. In his part of the country he could say he never asked a man to farm without a lease. He should think it was doing great injustice to the tenant not to give him the security which a lease afforded, nor, as far as his experience went, would he think he was doing justice even to the owner of the land, because he believed the greatest impulse had been given to improvements where leases of considerable length were granted. No doubt, if a farm was in good condition and admitted of but small improvement, a man might go in without the security of a lease and manage it to good purpose; but if there were large improvements to be undertaken, if a man were required to lay out, as was the case on many farms he had had to let, from £2,000 to £10,000, would it be reasonable to say, "I will not grant you a lease or give you any security for the capital you put into the land?" Although much might be said about good understandings between landlords and tenants, under which the same family had been found from age to age on the same land, he would ask, what had the public benefited by that? Did they find that great experiments were undertaken by tenants of that description? for however good might be the understanding which existed between one man and another, a Pharoah might arise "who knew not Joseph," and the family of the tenant might not be left in the position which justice to their interests required. He had listened with some pain to the gentleman who had spoken of some instances—he hoped partial and exceptional—of great cruelty to the labouring class. That was another argument furnished in favour of leases, for in the country where he had lived and had a good deal to do with landed property, where they had leases, no tenant would take a lease unless he had sufficient houses on the farm for his labourers to live in. It had been said that the cows and pigs were better accommodated than the labourers, and that the latter had often to walk long distances to and from their work. That was so absurd and impolitic a proceeding, that he could hardly conceive a person in his senses would continue it. In the north of England and in Scotland, there were numbers of cottages for the labourers near their work, and they had them rent-free. They were built by the landlord and maintained in repair by the tenants. Of late years he had built many hundreds of cottages—not in the old style, with a single room, where whole families were herded together without comfort or decency, but with three or four rooms and all kinds of conveniences. That led to another remark. Mr. Morton had very happily and properly alluded to the superior system of education amongst agriculturists of the present day. He had, however, in a great measure confined that to the sons of farmers and occupiers of land. He (the chairman) should be glad to say one word for the labourers. It was quite obvious that the class of men accustomed to perform the operations of agriculture some years ago, could not, without superior education and skill, manage the agricultural machinery now used. It was in this view of the matter, and desiring to promote the interests of agriculture, that he would suggest that each one of them should, as far as his influence went, aid in promoting the education of the labourer,—in fact, do what he could to elevate him in character and feeling. Even as a matter of mere policy this was important, because the work required was of a more skilled character than formerly. The value of the labourer did not now depend so much upon the strength of his limbs and sinews as upon the knowledge he could bring to bear in conducting his operations. Taking a higher view, however, he would say that it was also a matter of duty on the part of the higher classes to imbue the labourer with just sentiments as well as with knowledge beneficial to him in his occupation, and to educate the young amongst this class in such a way that they would perform their duties and fulfil their position in life as accountable beings here and hereafter. He was sure he should have the hearty concurrence of the meeting in tendering their best thanks to Mr. Morton for his very excellent paper.

The vote of thanks was then passed.

The Secretary announced that on Wednesday evening next, the 16th inst. a paper by Dr. Edward Smith, F.R.S., "On the Economic Value of Foods, having special reference to the Dietary of the Labouring Classes," would be read.

Proceedings of Institutions.

Glasgow Athenæum.—On the 27th of Nov., a meeting was held for the distribution of the prizes and certificates awarded by the Society of Arts. The Right Hon. the Lord-Advocate presided.—Mr. Provan read the report of the Athenæum Local Board, which states that the results of the examinations conducted under their auspices since they undertook the duty in 1859, are as follows: Number of students examined by Local Board, 179; passed by them 172; appeared at Final Examination, 169; passed, 151; unsuccessful, 18; papers worked, 208; number of first-class certificates awarded, 57; second-class, 76; third-class, 52; total number of certificates, 185; total number of prizes, 20. Hugh Tennant, Esq., of Errol, has this year not only subscribed £20 for prizes, as in former years, but by personal canvass has obtained additional subscriptions for the same object to the extent of £20 16s. Mr. Tennant at the onset having indicated a wish that the prizes should be given in sums of not less than £5 each to those students who excel the most at the Society's examinations, this principle has all along been kept in view. This year, therefore, the five following students, having all obtained first-class certificates, are each entitled to a prize of £5, viz.:—John Allan, James Bennie, Dugald Bell, Alex. Morrison, and David Lawrie.—The distribution of certificates and prizes was then proceeded with, the Lord-Advocate presenting them. When Mr. John Allan's name was called, his lordship stated that that gentleman, mainly through the distinction he had acquired in connection with the Society of Arts examinations, had obtained a Government nomination. At the close of the distribution, the Lord Advocate delivered an address. After referring to the alleged failure of Mechanics' Institutes, he said:—Although the experiment did not directly answer to the intentions of the founders of Mechanics' Institutes, although they did not get quite as deep down into the soil as they expected at first, yet what an amazing stride has the national mind taken in consequence of these great institutions; how different is the social atmosphere in which we live; how different is the general intellectual cast of all classes of society; how different the hours of relaxation; how different the ideas of amusement. In referring to the benefits the Athenæum derived from its connection with the Society of Arts, he alluded to the Prince Consort, one of the greatest benefactors of the country—one whose name will long be a household word in this land. With reference to the commonly used term, "Middle-class" Examinations, the Lord Advocate said:—I own that I do not altogether like the term of middle-class education. It offends against our old Scottish notions. In Scotland of old there was no middle-class education; there was all-class education, and the highest and the lowest sat on the same form at school and in college. The race was to the swift, whatever might be his degree. I am happy to say that the same principle still subsists in Scotland—that there is no necessary division of rank or station in the ordinary education of the land. He could not, however, but acknowledge that for such communities as this it was of the greatest possible service to have a stimulus like the present one, it was a moral engine of the strongest possible importance in such a community as this to hold out to young men an easy mode of making up the deficiencies which the strain upon their time and upon their minds had left in their ordinary education. He was happy to find that masters in this great city are fully sensible and strongly alive to the importance of the advantages held out by the Athenæum, and that they are now shortening the time of office and work-shop labour. He alluded to the pleasure he experienced at finding females amongst the certificate holders, and concluded by congratulating the institution on its prosperous condition. Votes of thanks were then passed.

Hertford Local Board.—A meeting of the local board in connection with the Society of Arts was held in the Town Hall, on the 1st instant, for the distribution of the prizes and certificates. Sir Minto Farquhar, M.P., presided. The Chairman congratulated the meeting on the success which had attended the exertions of the Board, and the candidates on the zeal and assiduity which they had manifested during the past year. From his own experience he could state that if any young man who went to the metropolis in search of employment in any office could produce a certificate from the Society of Arts, or a certificate granted at the Oxford or Cambridge examinations, he would have a much better chance of success than any other competitor for the same post. The prizes and certificates were then distributed by the chairman.—The Right Hon. W. Cowper, M.P., in moving one of the resolutions, made some remarks on the progress and state of education. It was a fortunate circumstance that the arrangements which had been made of late years for educating and examining the people were met by a disposition on the part of the young men of the country to be taught and examined. He was sure that all those young men who had taken advantage of the assistance which had been placed within their reach would be glad to the last day of their lives of the exertion which they had made. Certificates, bearing testimony to the patience, the industry, and the self-control of those young men would be to them as good as the title-deeds of an estate, for they were title-deeds of those moral and mental qualities which it was a blessing to them to be able to show. As far as his observations had been able to guide him, he should say that no one had failed altogether in life who had been at the same time industrious, prudent, and conscientious. The diffusion of education was of immense importance in this country, where power was so much in the hands of the middle classes, and he thought the experience we had had of the examinations of the Society of Arts was exceedingly gratifying to all those who were labouring for the promotion of this desirable object.

REMOVAL OF THE EXHIBITION BUILDING.

The contractors are at last vigorously at work in their preparations for removing the Exhibition Building. The timber of the floors has been taken up throughout the ground floor. The space under the Picture Galleries has been partially turned into stables. A steam-engine is at work raising the enormous scaffold necessary for taking down the domes, and this operation is being pushed on in the eastern dome, where it is expected that in a month from this time the scaffolding will be of a sufficient height to commence the removal of these structures, out of which the glass has for a long time been taken. As the work of removal proceeds the materials will be carted away to the Alexandra Park for re-erection, according to contracts which are now fully entered into. It is said that the materials of the glass courts have been sold to the London, Chatham, and Dover Railway Company.

Fine Arts.

Sheffield School of Art.—Eyre Crowe, Esq., one of the Government Inspectors of the Science and Art Department, has recently completed the annual examination at this school. Besides 70 of the students, as many as 170 pupils of public and private schools in and about Sheffield came up for examination in drawing, the results of which will not be known for three or four weeks. The Department have awarded bronze medals and honourable mentions to several students whose works were sent to London for adjudication. In future this plan will be adopted by

the Department with all schools of art; the students' works in competition for medals will have to be sent to London at a stated time every year, when the awards will be made according to a fixed standard of excellence.

Photosculpture.—References from time to time have appeared in the papers respecting this novel application of photography. Preparations are being made in Paris for carrying it out on a very extensive scale. The results are stated to be very successful. The *modus operandi* will be readily understood. The sitter or object to be sculptured is placed in the centre of a well-lighted, spacious apartment; twenty-four or even a larger number of cameras are ranged in a circle around him, at equal distances from each other, with plates duly prepared, and by a simple mechanical arrangement the operator, by one movement of the hand simultaneously uncovers all the lenses, and after a sufficient length of exposure closes them. The plates are then developed in the usual manner, a sufficient number of operations being employed for the purpose, and proofs are subsequently printed. There are thus obtained twenty-four or more views of the subject from twenty-four or more different points of sight. Each view is then in succession, by means of a magic lantern arrangement, thrown upon a screen on an enlarged scale. In order to transfer these likenesses from the photographs to the modelling clay, an instrument on the principle of the pentagragh is then made use of, having a tracer at one end and a cutting tool at the other. The lump of modelling clay is fixed on a stand, capable of turning on its axis, with divisions corresponding to the number of photographs employed, and is placed in a position so that while the tracer of the pentagraph passes over the outline of the photograph thrown on the screen, the cutting-tool at the other end cuts the clay into the corresponding outline. The clay is then shifted one division on its axis, and the next corresponding photograph thrown on the screen, and the operation repeated, and so on in succession till the clay has the twenty-four or more outlines accurately transferred to it. It then only remains for the artist to connect these tracings or outlines on the clay, and here of course his skill is shown. The artist thus has a large amount of work mechanically and rapidly prepared for him, and he is enabled, in a comparatively short time, to execute a model combining all the truthfulness of mechanism and the skill of the artist. From this model casts in plaster, or statues in marble, can be taken in the usual way. It is stated that the sculptures thus produced are remarkably good, and can be supplied at a very cheap rate, as compared with sculpture produced entirely by hand.

Manufactures.

Chain Makers' Strike.—An agitation has arisen among the chain makers of Cradley and the neighbourhood, with the view of obtaining an advance of wages. The men employed in this branch of trade are a very numerous body, and there are now or soon will be many hundreds of them on strike.

Boiler Explosions.—The November report of the Manchester Association mentions an illustration of the importance of removing portions of mid-feather walls, in order to give an opportunity of examining the plates. On this being done at the instance of the Association, in the case of a boiler lately put under its care, the bottom, although presumed by its owner and engineer to be perfectly sound, was found to be nearly eaten through by corrosion, and on the very point of rupture. Instances continue to be met with of serious corrosion, arising from the leakage of bolted joints concealed under brickwork. All connections to boilers should be made by means of fitting blocks riveted to the shell, excepting only the attachments to the front end plate, where they are not absolutely necessary, since the plate being flat the joints are more easily made, while at the same time, from their position, leakage, should it occur, is at once made apparent. The front end plate should be left completely open, and not, as is too frequently the case, covered in with a wall of brickwork, as leakage may thus go on undetected. Six explosions have occurred during the month, resulting in the death of eleven persons, and serious injury to eighteen others, one of the boilers in question being under the inspection of the Association.

Jute.—This fibre, which a few years ago was scarcely known as an import, is now largely brought into this country, and its use is daily extending in various directions. The cotton bags which were sent from this country to South America are now nearly superseded by bags of jute, which is extensively manufactured in the north.

Wine.—Mr. Berthelot, who first discovered that there is a particular oxidable principle in Bordeaux and Burgundy wines, to which he attributes their flavour, was recently induced to examine the influence which oxygen exercises over wine. He became convinced that this action is most unfavourable, and entirely destroys the bouquet, which is replaced by a most disagreeable flavour. Mr. Berthelot found it sufficient to pass a current of oxygen into the choice wines of St. Jean and Thorin to produce this result. He also demonstrated that the absorption of oxygen by wine, accelerated by the elevation of the temperature, is rendered almost immediate by the addition of an alkali. These observations prove how necessary it is to preserve wine in a perfect state from the action of the oxygen contained in the air, since the prolonged contact of 10 cubic centimetres of oxygen, that is, 50 cubic centimetres of air, is sufficient to destroy the bouquet of a quart of wine. It is to the slow penetration of oxygen into bottles that Mr. Berthelot attributes the destruction of flavour which every wine experiences at last. The reason that the racking off of new wine from the vat to the cask does not produce a similar result is that new wine, being saturated with carbonic acid, disengages a portion of it when exposed to the air, so that the wine is in a great measure preserved. The decomposition of wine in bottles half full, and the diminution of the flavour, is caused by the action of oxygen. The complete destruction of the flavour of wine by the addition of an alkaline mineral water, such as that of Vichy, is explained by the preceding facts.

Ornamentation of Glass.—A piece of muslin, after being stretched, is impregnated with grease, by means of a roller passed over it, and it is pressed so as to cause it to adhere to a piece of clean glass, from which it is afterwards carefully detached. The glass has thus impressed upon it the greasy lines of the lace, and, on being exposed to the fumes of fluoric acid gas, the portions unprotected by the grease are attacked by the fumes, and the result is a polished pattern on a "matted" ground. Glass thus prepared acts as a blind, preventing those who are outside from looking in, while those who are inside can readily see what is going on without.

Commerce.

Grain and Flour.—Speculators who heretofore turned their principal attention to cotton, have been purchasing flour largely in France since the harvest, and a quarter of million sacks have been purchased in Nantes, the Bristol of France, for importation to England since the harvest. The periods for delivery extend till the month of May. The millers in the Maine and Loire, Sarthe, and other departments of France, have taken contracts for nearly all they can supply for the English market. Prices have consequently advanced fully 10 per cent. since the harvest, and are still going up. Wheat is, relatively, much cheaper than flour in France.

Sugar in France.—At present there is more excitement among dealers in this article than there has been for the last seven years; indeed, the oldest merchant cannot

recollect so rapid a rise in prices. In Nantes there are three large refineries besides several small ones; the former are the most extensive in Europe. One of them manufactures from 100 to 200 tons per day, another 70 to 80, and a third 50. The total quantity refined per day in that town is about 300 or 350 tons. During the last three years several speculators there held large stocks of raw sugar, but owing to the frequent changes made with respect to the duties, they lost immense sums of money, and, with the exception of three, who have persevered, these gentlemen have gradually diminished their stock. As a natural consequence, the failure of the beetroot crop this year in France, and the diminution of the colonial supply, have caused a very rapid rise in prices, which have been still further advanced by the fact of the stocks in the refiners' hands being smaller than usual this year. So rapid has been the upward movement, that bags containing a hundred-weight purchased at 49 francs, duty paid, six weeks since, were sold on Tuesday, the 1st instant, for 64 francs, an advance of very nearly 25 per cent. The news from Paris and Havre during the two following days stopped the rise and made the market at Nantes dull, but as the whole stock at the last named place is not more than 40,000 bags, 500 hogsheads, and 2,000 boxes, and as the refiners hold very little, it is generally expected there will be a revival in the Nantes market in a few days. About 7,000 tons have been purchased in London and Glasgow for the importers of Nantes, but as that quantity is not equal to more than three weeks' consumption, it has not a very great effect on the market. The report is that the refiners there must purchase at least 2,000 tons more in England to keep their works going until the new sugar begins to arrive from Bourbon and Mauritius. The news of the Bank of England having raised the rate of discount to 8 per cent., produced a downward tendency in the price of sugar. It is calculated that the speculators of Nantes have realized within a month from £100,000 to £150,000, in consequence of the rise in price. The last advices from the French colonies state that want of rain has caused the sugar crop to be small and late, and that scarcely any new sugar is to be expected before January or February, the greater part of that on hand being taken up for America. The falling off in the crops of Mauritius and Bourbon alone this year is estimated at 100,000 tons. The stock at Marseilles is said not to exceed 3,250 barrels from the Antilles, and 18,600 boxes from Havannah, but at the present moment there are as few buyers as sellers, and consequently the market remains stagnant.

Silk.—Accounts from the silk market of Aubenas, in the department of the Ardèche, state that the supply of raw silk is greater than it has been for some time. Some extensive holders having occasion for ready money, have decided to sell even at a considerable reduction of their previous demands. For example, some silk of very superior quality was lately sold at 61f. the kilogramme, for which 66f. was asked not long since. Silk of second quality has been sold at from 54f. to 58f. the kilogramme. At present the supply is greater than the demand. It is said that the silk-spinners in Lyons are not in a very prosperous condition, the preference being given to Italian spun silk, in consequence of its relative cheapness.

Cotton in the River Plate.—The Cotton Supply Association of Manchester have sent out twenty bags of cotton seed for distribution, and several cotton-growing companies have been established in Corrientes, under the auspices of the governor of that province. The Estancieros in other parts of the Argentine Republic have also sown cotton seed with the most hopeful prospects, and in Paraguay the same spirit is beginning to animate the native population. The *Buenos Ayres Standard*, in its European summary, says:—"We promise the English manufacturers 5,000 bales of cotton from the River Plate this season, and 100,000 the next. In payment for our cotton bales we do not ask for gold but for railway iron, cotton goods, coal, &c."

Colonies.

Correspondence with the Cape.—The Mail for England per "Saxon" consisted of 10,952 letters, 169 registered letters, 36 books, and 4,945 newspapers. The mail from Port Elizabeth consisted of 1,675 letters (including 55 registered), and 1,815 papers. The number of letters received from England by the last mail in Port Elizabeth was 1,200.

Weather at the Cape.—Such a season as this present spring has never been known. During the winter, which set in unusually early, rain and sunshine, in most seasonable alternations, have stimulated the earth's producing powers to the utmost. There has been no reverse of any kind to mar the abundant promise. Rain and wind have both been so tempered as to insure the fullest development of the fruits of the earth, without causing damage to either the seed or the blossom. And throughout the western divisions of the colony, at any rate, the promise of corn, fruit, and wine never was fairer, though there is an appearance of the *oïdium* at an earlier period than usual in some vineyards where sulphur has not been applied.

Cape Town Mechanics' Institution.—The last report says that notwithstanding the unprecedented depression that has existed, affecting business and trade generally, the Institution has still retained the favourable position mentioned in last year's report, the amount of subscriptions received during the two winter quarters of 1862 being £18 5s., and for the two quarters just ended £20 14s. Notwithstanding the large increase in the income of the year, the committee regret having to report a considerable increase in the liabilities of the Institution. This has principally occurred through the subscriptions being about £20 below the working expenses of the Institution, and the great decrease in the receipts of admission to the lectures, several of which were delivered during the past winter session: one by E. L. Layard, Esq., "A Trip to New Zealand with Sir George Grey;" one by Rev. W. Thompson, "A brief Review of the Writings commonly attributed to Moses, and the conclusion to which it leads;" one by Mr. T. Walter, on "Astronomy," and many others. During the past six months upwards of seven hundred volumes of books, and nearly five hundred periodicals, have been taken out for perusal by the members.

Publications Issued.

Chemical Technology, or Chemistry in its application to the Arts and Manufactures; by Dr. Thomas Richardson, and Henry Watts, F.C.S. (*H. Bailliere.*) The two first parts of this work, illustrated by upwards of 400 engravings, contain descriptions of the mode of preparation and uses of fuel of all sorts. Part 3, just out, is on acids, alkalis, and salts, their manufacture and application. This portion of the work contains articles on potash, soda, soap, railway grease, &c., with detailed descriptions of the most approved modes of manufacture, and is illustrated by numerous wood engravings.

Elementary Treatise on Physics, by Professor Ganot, translated by E. Atkinson, F.C.S. (*H. Bailliere.*) The subjects treated of are matter, force, motion, gravitation, liquids, gases, acoustics, heat, light, magnetism, and electricity, with outlines of meteorology and climatology; the work is illustrated by nearly 600 engravings.

A Treatise of Sugar Machinery; including the Process of producing Sugar from the Cane; refining moist and loaf Sugar, home and colonial. The mode of designing, manufacturing, and erecting the Machinery; together with Rules for the proportions and Estimates. Illustrated by four single and twelve large folding plates. By N. P. Burgh, Engineer. Royal 4to., price 30s. (*E. and F. N. Spon.*)

Forthcoming Publications.

Cyclopædia of Useful Arts, Mechanical and Chemical, Manufactures, Mining, and Engineering, illustrated by upwards of 2,500 engravings; edited by Charles Tomlinson, lecturer on science, King's College School, London. (*Virtue.*) A new edition of this cyclopædia is about to be published in about 27 parts at two shillings each, imperial 8vo. In the original prospectus, the editor stated that he had attempted to convey to his readers, not a mere sketch of what is to be seen at the surface of our manufactories, but a comprehensive account of the processes of the useful arts, in connection with the scientific principles on which they are based, and he did not attempt to make his descriptions appear easy by the omission of those details which, however difficult to explain in popular language, are yet of great importance. In this new edition the whole work will be carefully revised, corrected, and harmonised, and the progress of the useful arts during the time which has elapsed since the completion of the original edition will be given in alphabetical order in an appendix to which reference will be made in the body of the work.

Notes.

The late Storms in France.—The tempest which has raged on both sides of the Channel has done immense damage in France. On the 3rd instant, the state of the Loire was terrible, the wind attained a velocity of more than seventy miles an hour, the river was in such a condition that no small boat could swim, and all the lighters were driven on shore. Ten fatal accidents happened in the streets of Nantes from the falling of chimneys, tiles, and slates. A telegram received in the above named town on the 4th instant, announced the loss of no less than twelve coasting vessels in the Bay of Camaret. But one of the most lamentable accidents occured at Cherbourg, on Wednesday, the 2nd instant, at three in the morning. The *Argus*, a trading vessel from Granville, was thrown on the north-west point of the Island of Pélée. The weather was frightful. The cries of the crew of the *Argus* were heard, and the commander of the iron-plated frigate *La Couronne*, lying in the harbour, sent his barge, manned by eighteen choice seamen, to the aid of the crew of the unfortunate *Argus*, which after great exertions was got off. The port officer, seeing the danger of both ship and boat, sent a small steamer to tow them into the harbour, but at 8 a.m. the wind suddenly became furious, the tow ropes were broken, and the *Argus* and the boat of the *Couronne* cast adrift, and the latter, being carried by the wind towards Cape Teir, was thrown on the rocks of Fermanville and every soul on board her perished. Three of the boat's crew had been put on board of the *Argus*, and the loss was thereby reduced to sixteen. One account states that the whole of the crew of the *Argus* were saved except the captain; but a short account given in the *Moniteur* states the number of lives lost by this lamentable catastrophe to be thirty-two. At Toulon the roof of the theatre was stripped entirely off by the violence of the wind.

Prince Consort Memorial.—Mr. William Jackson, M.P., has determined to erect at Birkenhead, as a memorial to the Prince Consort, not a simple monument, but industrial ragged schools, at a cost, including the site, of £7,000. The institution is to be called "The Albert Refuge."

South London Working Men's Industrial Exhibition.—It has been determined to open the exhibition on the 1st of March next, and that the classification of articles should be:—1. Useful; 2. Ingenious; 3. Ornamental; 4. Scientific; 5. Artistic; 6. Literary; 7. Amusing; 8. Curious; 9. Miscellaneous. It has also been agreed to adopt the recommendation of the working men's meeting in reference to a small charge being made for admission, and that the exhibition should remain open for one week. Several applications for space have already been made by working men.

Thames Embankment.—The first foundation piles are being driven opposite the late residence of the Duke of Buccleuch. Operations have also been commenced for the embankment on the southern side, which will be carried out simultaneously with that on the Middlesex side.

Mechanics' Institution at Bombay.—Mr. David Sassoon, a merchant in Bombay, has offered the sum of £6,000, on condition of government giving an equal sum and a site, for the erection of a suitable building for the Mechanics' Institution and for public meetings.

Railway Break.—Experiments have been made on the Entre-Sambre-et-Meuse Railway, in Belgium, to test the efficacy of a new break, the invention of a lady, Mdlle. Micas. The principle of the invention consists in the sudden application of a sort of wooden skate or wedge to the wheel, whereby it is raised a millimetre or two. From that moment the rapidity of the train is checked. The action on the break is transmitted by a single man pressing upon a rod connected with the wedge, and without the aid of a screw. The engineer of the Government railways in Belgium directed the experiments, and many other Belgian and foreign engineers were present. A train, weighing 185,000 kilogrammes, was allowed to descend a gradient of 14 millimetres per metre by its own weight, and without the aid of an engine. Two breaks being used, the train was stopped, in a space of 300 metres, while going at a speed of 36 kilometres (22½ miles). In another experiment a train was drawn by a 16-inch engine, with four coupled wheels, along a level railway, and at the full speed of 55 kilometres (34 miles) per hour, a single break stopped the train within the space of 400 metres. With two breaks the stoppage was obtained within the space of 175 metres; and at a speed of 60 kilometres (38 miles) per hour, the stoppage was effected within a space of 165 metres only.

Locomotion.—A correspondent writes:—A great want of the present day is a cheap mode of locomotion for one or more persons, corresponding to the gig or dog-cart, but independent of animal power; and probably, if the attention of inventors were drawn to the subject by an offer of the Society of Arts medal, the want might be supplied. The original cost of the article is not so much an object as the continued cost of the motive power, and the getting rid of the trouble and annoyance associated with draught animals. Besides, when such an article is brought into use there will be a tendency to economy of construction, and it may be hoped that, eventually, even the costermonger's donkey may become a mere tradition.

Transmission of Patterns by Post.—To a recent memorial from the Bradford Chamber of Commerce on the subject of the charges upon patterns by post, the Postmaster-General has replied that, with regard to the inland postal scale, there is reason to fear that the department already sustains some loss by the inland book post, and that he does not feel justified, under these circumstances, in adopting the same rate of charges for the pattern post, and thus incurring the risk of further loss. The charge is now three times the book rate. As to the transmission of patterns abroad, he states that arrangements have already been made with the Italian and Canadian Post-offices for the transmission of patterns at a moderate rate, and that the measure in each case is appointed to come into operation on the 1st of January, 1864. Negotiations have also been entered into for the establishment of a pattern post between this country and the German Postal Union, Belgium, India, and the Cape of Good Hope, and similar negotiations are in contemplation with other foreign countries, and with all the British colonies.

Correspondence.

Electric Regulators.—Sir,—In reply to the observations made by Dr. Bachhoffner, at the meeting on the 2nd instant, with reference to the spring in Mr. Holmes's lamp being objectionable, may I be allowed to say it is simply used as a counterpoise to a slight catch, and not as a motive power, that being provided for in the difference of gravity between the two carbon holders, and therefore the idea that a mainspring is used to move the various parts (as in most other lamps), and which he thought so highly objectionable, is entirely without foundation. Having had, perhaps, as much experience in the working of different kinds of electric lamps as any one in London, I have no hesitation in saying that Mr. Holmes's is the most perfect, as it will burn more than three hours without a flicker—the carbons then require renewing. In reference to the letter by Mr. S. Highley, in last week's *Journal*, in which he speaks of "the trial of electric lamps" at the Polytechnic, I beg to say that no competitive trial took place, and that I did not have a lamp there of my own manufacture. I was engaged part of the time giving a lecture (on spectrum analysis) in the small theatre, where I used a lamp of Duboscq's make, after which I had an opportunity of observing the light from those in the hall, and could not help noticing the unsteadiness of the one referred to in Mr. Highley's letter.—I am, &c., W. Ladd.

11 and 12, Beak-street, Regent-street, W.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...R. Geographical, 8½. 1. Mr. Robt. Swinhoe, "On Formosa." 2. Mr. F. A. Eaton, "Journey from Nazareth to Bozrah-Moab, and thence to Damascus."
British Architects, 8.
Medical, 8½. Mr. J. Baker Brown, "On the Treatment of Hypertrophy and Ulceration of the Os Uteri."

Tues. ...Civil Engineers, 8. Annual General Meeting.
Statistical, 8. 1. Professor Rogers, "On the continuous Price of Wheat for 102 Years (1380-1481)." 2. The President, "On Sumptuary Statistics (1506-1863).
Pathological, 8.
Syro-Egyptian, 7½.
Anthropological, 8.

Wed. ...Society of Arts, 8. Dr. Edward Smith, F.R.S., "On the Economic Value of Foods, having special reference to the Dietary of the Labouring Classes."
Geological, 8. 1. Rev. Prof. S. Haughton, M.A., "On the Granites and Syenites of Donegal, &c." 2. "Letters relating to Recent Discoveries of Fossil Reptiles in Central India." By the late Rev. S. Hislop. Communicated by Prof. T. R. Jones. 3. Mr. J. W. Farren, "Letters relating to the Recent Earthquake at Manila." Communicated by Sir R. I. Murchison. 4. Mr. W. Vicary, "On the Pebble-bed of Budleigh Salterton," with Notes on the Fossils by Mr. J. W. Salter.
London Inst. 7.

Thur. ...Royal, 8½.
Antiquaries, 8.
Linnæan, 8.
Chemical, 8.
Philosophical Club, 6.

Fri.......Philological, 8.

Patents.

From Commissioners of Patents Journal, December 4th.

Grants of Provisional Protection.

Agricultural engines and boilers—2858—R. A. Brooman.
Amalgamating the precious metals—2819—W. E. Gedge.
Armour for ships, &c.—2848—T. S. Prideaux.
Barometers, gas regulators, &c.—2383—J. Bailey, G. W. Blake, and W. H. Bailey.
Boats, towing—2872—J. J. Maurer.
Cartridges—2888—W. Wigfall and G. Jolly.
Cartridges—2870—G. T. Bousfield.
Chopping animal and vegetable substances—2832—W. F. Dearlove.
Coal, &c., distilling—2812—A. Craig.
Coal and peat, distillation of—2886—W. M. Williams.
Cotton gins—2844—J. C. Wilson.
Dyeing colours—2894—H. Hirzel.
Filters—2874—C. W. Harrison.
Fire-arms, breech-loading, &c.—2883—R. Mayer
Gas meters—2878—W. Cowan.
Iron and steel—2852—W. E. Newton.
Labels on bottles, &c.—2869—A. P. Henry and R. T. Power.
Looms—2834—J. W. Drummond.
Looms—2838—M. A. Muir and J. McIlwham.
Omnibus passenger recording apparatus—2514—A. Crellin.
Ordnance and small arms—2876—P. M. Parsons.
Ores, pulverising—2864—C. Pengelly.
Paper spools or tubes used in spinning machines—2860—T. William and I. Naylor.
Poisons, prevention of accidents from—2866—G. Thonger.
Postal envelope for pattern,s &c.—2709—T. Adams and J. Scott.
Printing presses—2856—R. A. Brooman.
Railway brakes—2557—L. Eynard.
Railway waggons—2632—A. Potter and W. P. Potter.
Railways, atmospheric—2830—G. Remington.
Rollers for blinds, maps, &c.—2836—G. T. Bousfield.
Rudders—2854—J. Lewis.
Sewing machines—2842—J. P. Binns.
Ships, sheathing—2880—J. Betteley.
Ships, propelling—2868—R. Griffiths.
Ships, and machinery for propelling them—2288—C. H. Chadburn and W. J. Tristam.
Ships, fastening together the parts of, and caulking—2756—R. Saunders.
Shuttles—2816—H. Holden.
Silk, machinery for doubling, twisting, &c.—2810—B. A. Murray.
Spinning machinery—2617—J. Ronald.
Spinning and doubling machinery—2828—W. Robertson.
Starches, coloring—2839—J. Medway and S. Joyce.
Steam boilers—2890—J. Stewart.
Steam generator—2822—L. E. C. Martin.
Taps—2716—J. Macintosh.
Telegraph cables—2826—C. W. Siemens.
Umbrella covers—2850—W. A. Lyttle.
Waterclosets—2835—G. K. Geyelin.

Invention with Complete Specification Filed.

Fire-arms—2998—M. R. Pilon.

Patents Sealed.

1407. W. A. Brown.	1489. S. S. Robson.
1410. C. E. Newcomen.	1492. J. Forrester.
1412. N. Walton.	1530. R. Jobson.
1415. W. Clark.	1531. J. L. Clarke.
1419. W. E. Gedge.	1555. W. L. and T. Winans.
1423. H. Reynell.	1556. W. L. and T. Winans.
1426. J. Petrie.	1557. W. L. and T. Winans.
1442. W. Roberts.	1558. W. L. and T. Winans.
1450. T. M. Harrison.	1565. W. Snell.
1451. M. Henry.	1573. W. E. Newton.
1455. C. L. V. Tenac.	1773. M. Henry.
1465. F. A. and F. Calvert.	1776. D. C. G. Clemm.
1466. G. Davies.	2041. R. Baillie.
1477. J. Jones.	2129. C. Harratt.
1479. T. Wrigley.	2228. E. Oliver and G. Myers.

From Commissioners of Patents Journal, December 8th.

Patents Sealed.

1443. T. Adams.	1502. F. S. Williams.
1446. T. Evans and E. Hughes.	1509. A. J. Fraser.
1470. G. Bedson.	1570. W. L. and T. Winans.
1471. T. C. March.	1571. W. L. and T. Winans.
1473. R. Hughes.	1572. W. L. and T. Winans.
1480. J. Hopkinson.	1589. S. Knowles & R. Hayward.
1483. T. A. Elliott.	1593. S. Smith.
1486. M. B. Westhead.	1651. J. King.
1488. H. G. W. Wagstaff.	1666. H. A. Bonneville.
1490. J. Shand.	2245. M. Gerstenhofer.
1501. J. J. Shedlock.	2546. J. H. Johnson.

Patents on which the Stamp Duty of £50 has been Paid.

2947. A. Jackson.	3030. R. Mushet.
3009. J. Robson, jun.	2980. C. S. Duncan.
2959. W. Pilkington.	3017. D. Annan.
2963. E. T. Hughes.	3138. J. Chatterton and W. Smith.
2960. W. and J. Galloway.	3143. J. Jobson.
2982. C. W. Siemens.	3045. R. Mushet.
2985. E. Morewood.	3070. R. Mushet.
3010. R. Mushet.	

Patents on which the Stamp Duty of £100 has been paid.

2861. F. Siemens.	2915. T. Vicars, sen., T. Vicars, jun., T. Ashmore, and J. Smith.
2867. A. and W. Bullough.	2916. T. Peake.
2874. J. Apperly and W. Clissold.	2936. T. and W. Wheatley.
2884. D. Crawford.	
2894. W. H. Bowers.	

Registered Designs.

Parasol, dome of—4599—Nov. 27—T. Evans, 17, Pentonville-road, N.
Scarf Ring (the Eclipse)—4600—Dec. 1—W. Lewis, 13, Cheapside.
Rack Pulley—4601—Dec. 4—J. Collins, Birmingham.
Lamp—4602—Dec. 5—J. E. Gardner, Strand, W.C.
Vermin Trap—4603—Dec. 7—C. Pullinger, Selsey, near Chichester.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, DECEMBER 18, 1863. [No. 578. Vol. XII.

Announcements by the Council.

Art-Workmanship.

The works submitted in competition for the Prizes offered by the Society will remain in the Great Room till Monday next, the 21st inst., after which they will be removed to the South Kensington Museum.

Mr. Richard Redgrave, R.A., Mr. Digby Wyatt, M.R.I.B.A., and Mr. John Webb, the judges appointed by the Council, have made the following awards :—

1. *Modelling in Terra Cotta, Plaster, or Wax.*

(*a.*) The Human Figure in bas relief, after Rafaelle's design of the "Three Graces."—23 works sent in.

1st Prize of £10 to J. Griffiths, 51, Coleshill-street, Eaton-square.

2nd Prize of £5 to A. Cheseneau, 11, Roxburgh-grove, Haverstock-hill.

(*b.*) Ornament in bas relief, after arabesques by Lucas van Leyden, 1528.—8 works sent in.

1st Prize of £5 to C. H. Whitaker, Sheffield-place, Coventry-road, Birmingham.

2nd Prize of £3 to J. Steel, jun., 88, Hanover-street, Glasgow.

2. *Repoussé Work in any Metal.*

(*a.*) The Human Figure as a bas-relief, after Rafaelle's "Three Graces."—3 works sent in.

1st Prize of £10 not awarded.

2nd Prize of £5 to E. Beresford, 47, Green-street, Stepney.

(*b.*) Ornament, after a Flemish salver in the South Kensington Museum, date about 1670.—1 work sent in.

1st Prize of £5 to G. Webster, Woodbank, Walkley, near Sheffield.

2nd Prize of £3 not awarded.

3. *Hammered Work, in Iron, Brass, or Copper.*

Ornament, after an iron German arabesque, about 1520, in the South Kensington Museum.—2 works sent in.

1st Prize of £5 not awarded.

Two 2nd Prizes of £3 each to T. Bailey, 77, King Edward-road, Birmingham, and W. Ash, 7, Martlett's-court, Bow-street.

4. *Carving in Ivory.*

The Human Figure in bas-relief, after a terra cotta ascribed to Luca della Robbia, about 1420, in the South Kensington Museum.—4 works sent in.

1st Prize of £10 to J. W. Bentley, 22, Sherwood-street, Golden-square.

2nd Prize of £5 to "Ricardo" (name not given).

5. *Chasing on Metal.*

(*a.*) The Human Figure, after a reduced copy of Gibson's Psyche.—6 works sent in.

1st Prize of £10 to W. Holliday, 14, Naylour-street, Islington.

2nd Prize of £5 to C. Jacquard, 1, St. George's-road New Kent-road.

(*b.*) Ornament, after a bronze plaque in the South Kensington Museum.—11 works sent in.

Two 1st Prizes of £5 each to G. R. Meek, and R. E. Barrett, at Messrs. Hunt and Roskell's, 26, Harrison-street, Gray's Inn-lane.

Two 2nd Prizes of £3 each to R. Orpwood and G. Gibaud, at Messrs. Hunt and Roskell's.

6. *Enamel Painting on Metal, Copper, or Gold.*

(*a.*) The Human Figure, after Rafaelle's design of the "Three Graces," executed in grisaille.—None sent in.

(*b.*) Ornament in grisaille, after a German arabesque, 16th century.—1 work sent in, but not in accordance with the conditions.

7. *Painting on Porcelain.*

(*a.*) The Human Figure, after Rafaelle's "Boy Bearing Doves," in the cartoon of the "Beautiful Gate."—5 works sent in.

1st Prize of £10 to E. E. Dunn, Eastwood-vale, Hanley, Staffordshire.

2nd Prize of £5 to Thos. Allen, Howard-place, Shelton, Staffordshire.

(*b.*) Ornament, after arabesques by Lucas Van Leyden, 1528.—3 works sent in.

1st Prize of £5 not awarded.

2nd Prize of £3 to J. B. Evans, South-street, Mount Pleasant, Fenton, Staffordshire.

8. *Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.*

Ornament, after a majolica plate in the South Kensington Museum, 1490.—2 works.

1st Prize of £5, not awarded.

Two 2nd Prizes of £3 each to F. Braun, and H. Braun, 15, Cleveland-street, W.

9. *Engraving on Glass.*

Ornament, after arabesques by Lucas Van Leyden, 1528.—None sent in.

10 *Embroidery.*

Ornament, after a German example in the Green Vaults at Dresden.—1 work.

No Prize awarded.

Cantor Lectures.

Courses of Lectures (under the title of "the Cantor Lectures") on the following subjects, will be delivered during the Session :—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. Hastings, Esq., Barrister-at-Law.

Fine Arts Applied to Industry. By W. Burges, Esq.

Chemistry Applied to the Arts. By Dr. F. Crace Calvert, F.R.S.

The third lecture of Mr. Hastings' course will be delivered on Monday, the 25th January, at 8 o'clock, the subjects of which, and of the concluding lecture, will be as follows :—

Contraband; its Nature and Usages.
Capture of Private Property at Sea; present State of the Law as modified by the Declaration of Paris; Arguments for and against its Continuance.
The Foreign Enlistment Act; its Operation on Commerce.

The Michaelmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

COMMITTEES OF REFERENCE.

Mechanics and Engineering.

This committee met on Friday, the 4th inst., to consider how information might best be obtained on subjects suggested in the Society's new Premium List, and to discuss other topics connected with mechanical and engineering improvements which it might be thought desirable to bring under the consideration of the Society. W. Hawes, Esq., Chairman of the Council, presided, and in opening the proceedings called attention to the subjects embraced under this head for which premiums had been offered by the Society. He first called the attention of the Committee to the prize offered under the will of the late Dr. Fothergill, for the best method of preventing and speedily extinguishing destructive fires, &c., and mentioned that the Society's medals were offered for the most efficient steam fire-engine for land use, and also for the best that was capable of self-propulsion.

Mr. D. K. Clark remarked, that the only satisfactory test of fire-engines was a public trial of their action. One or two trials of that kind had taken place within the last twelvemonths, but it seemed that the conditions required to be more clearly defined than had hitherto been done. He thought further trials were needed. On the subject of smokeless locomotive engines, which was mentioned at a former meeting of the Committee, he believed a new description of engine, modified from the original designs, was being constructed for the Metropolitan Railway. That, however, could hardly be a matter of competition, from the very limited demand there was for that description of fire-engine.

Mr. Mereweather remarked that the trials of fire-engines required to be made under more carefully considered conditions. The actual quantity of water thrown, as compared with the theoretical quantity, was not shown, and the horse-power developed by each engine was not recorded, nor was the power of the boilers accurately defined. It was a trial rather of the skill of the fireman than of the mechanical merits of the engine. He thought conditions might be arranged by which future trials could be made more satisfactory. The amount of property that could be saved by the use of steam fire-engines even in their present state was enormous, and he regretted they were not more generally in use.

Mr. Blackie thought any theoretical statements on this subject apart from actual experiment would be useless.

Mr. John MacGregor regarded this subject as analogous to that of life-boats. Mere description without practical test would be valueless.

Mr. Mereweather remarked that the relations of the weight and power were the main considerations in these engines.

Mr. Davison, upon the general subject of preventibility of fires, advocated a system of heating public buildings by means of hot air propelled by fan machinery, which might be modified to suit ordinary dwellings.

Mr. John Grantham submitted the subject of the safety of ships from fire as one worthy of the consideration of this committee. Mr. Milner of fire-proof safe celebrity, had patented a fire-proof bulkhead for ships, a very excellent thing, but little attention had been paid to it. Another means of making a fire-proof bulkhead was the having two thicknesses of iron, and the interior filled with water. There might be two or three such bulkheads in a ship. In the case of the *Sarah Sands*, the bulkhead was the means of saving the ship.

Sir Edward Belcher, reverting to the subject of heating by air, mentioned the successful use of Perkins's hot-water tubes on board the *Terror* during the Artic expedition. He advocated the use of compartments, both air tight and water-tight, as giving a ready means of extinguishing fires. He, however, considered it a mistake to use water at all to put out a fire on board ship. He had formerly set the men to put out fire with their jackets, and if the rigging caught fire the marines blew it out with their muskets.

Mr. Blackie remarked that steam was the best-known extinguisher of fire, and in the case of steamers was always available for that purpose if the necessary arrangements were made.

Mr. Varley agreed with the suggestions made with regard to compartments in ships.

A letter was then read from Mr. Wise, referring to steam boilers, and describing one newly invented, which he thought possessed many advantages.

A discussion then ensued as to the future course of proceedings by the committee.

CANTOR LECTURES.

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. Hastings, Esq.

2nd Lecture, Monday, Dec. 14.—The Law of Blockade.

Mr. Hastings commenced his second lecture by a recapitulation of his first; and then proceeded to explain what was the existing law on the subject, differing as it did in this country and others. There were three admitted requisites for enforcing a blockade by condemnation; the first, that the blockade shall be actually established; the second, that knowledge of the fact shall have been communicated to the parties against whom the law is put in force; the third, that the blockade shall have been violated. With regard to the first point, French publicists held that the blockade must be enforced by an adequate number of ships stationary off the port, and so near to each other as to cause manifest and immediate danger to the vessel attempting an entrance. Hautefeuille, a living writer of great ability and acuteness, though unfortunately biassed in some of his opinions by his excessive prejudice against this country, had advanced the doctrine that the ships so stationed ought to be so near that their fires would cross; and he based this doctrine on the principle that no state has any right to exercise a prohibitory jurisdiction over any portion of the sea unless it has reduced that portion into its own possession England had never admitted the French view of the law on this point, which was endeavoured to be forced on her by the armed neutrality; and in the convention of 1801 she only assented to this enunciation of the law—that the blockade, to be effectual, shall be maintained by vessels stationary off the port, *or* sufficiently near, &c.; a difference of a word only, and of a very little word, but one which was vital to the whole question. By this qualification England had retained the right of blockading by a cruising squadron. The stipulation in the Declaration of Paris, 1856, by which it was declared that blockades must be effectual, was aimed at paper blockades, and did not substantially alter, if it altered at all, the English view of the law. Mr. Hastings read the letter of Earl Russell to Mr. Mason, the Commissioner of the Confederate States, in which this point was stated very clearly, and which must be taken as a declaration of the opinion of

the British Government as to the construction of the Paris Declaration. With regard to the second requisite—notification—the French law again differed from our own. The French required that actual notice shall have been given to the neutral vessel approaching the port of the existence of the blockade; and their practice was that such notice shall be entered in the ship's log, or endorsed on her papers. In 1849, when France was blockading the ports of the Argentine Confederation, the *Louisa* was captured for breach of the blockade; and was subsequently released by the French Prize Court, on the ground that the existence of the blockade, and a general notice of it, were not sufficient, and that the blockading force was bound to have given actual notice to the *Louisa* herself. On the other hand, the English authorities held that a public notification, or notice of the blockade communicated to the Government of the country to which the neutral vessel belongs, was sufficient for condemnation; and they carried this constructive notice even further, and held that it might be given by notoriety. After alluding to the judgment in the case of the *Francisca* during the late Russian war, Mr. Hastings said that with regard to the third requisite—that of violation of the blockade—it might take place either actually through the blockading force, or in intention from the moment the vessel quitted her port. In either case she might be seized, and condemned on sufficient evidence. With regard to the existing blockade of the Southern ports in America, Mr. Hastings thought there could be no doubt that it was good and effectual according to English principles, whatever it might be in the extreme views of continental publicists; and we were clearly bound to observe it, whatever temporary suffering and embarrassment it might cause to this country. Mr. Hastings then proceeded to consider the effects produced on international commerce by the existing law of blockade, and pointed out the fearful injuries which it was liable to inflict on neutral and innocent parties, now that the whole world was bound together by such close commercial ties, and nations made dependent on each other for the supply of raw material and food. Whether commercial blockades ought to be abolished, was a subject on which great difference of opinion existed, especially with reference to the naval interests of England; but the question must present itself to the minds of most whether, as a fact, it would be possible to continue them with effect, in the face of the altered and altering circumstances of Europe; railways and electric telegraphs making it no longer possible to close up the export and import trade of any country possessing a neighbour with sea-ports.

Fifth Ordinary Meeting.

Wednesday, December 16th, 1863; Edwin Chadwick, Esq., C.B., in the chair.

The following candidates were proposed for election as members of the Society:—

Adams, Thomas, 5, Alfred-terrace, Spa-road, Bermondsey, S.E.
Burn, Charles, 3, Middle Scotland-yard, Whitehall, S.W.
Byron, Thomas, Wolverhampton.
Dart, Richard, 12, Bedford-street, Covent-garden, W.C.
Flower, Charles Edward, Stratford-on-Avon.
Harcourt, Colonel Francis Vernon, 5, Carlton-gardens, S.W., and Buxted-park, Uckfield.
Moon, William, F.R.G.S., 104, Queen's-road, Brighton.
Rood, John Yeoman, Compton-street, Soho, W.
Simons, William, London Works, Renfrew, N.B.
Soul, Matthew Augustus, 3, Leadenhall-street, E.C.
Spode, J., Hawkesyard-park, near Rugeley.
Tasker, William, Halifax.
Wilson, Robert H. C., 12, Wilson-st., Gray's-inn-rd., W.C.

And as Honorary Corresponding Member,

Coomàra-Swamy, Mutu, Mudeliàr. Ceylon.

The following candidates were balloted for and duly elected members of the Society:—

Atkinson, George, 2, Highbury-park, N.
Baker, Edward, 36, Great Ormond-street, W.C.
Baring, Thomas, M.P., F.R.S., 41, Upper Grosvenor-street, W.
Blackburne, Rev. Thomas, Club-chambers, 15, Regent-street, S.W.
Buckland, Wm. John, Drummond-chambers, John-street, Adelphi, W.C.
Cook, Henry, Cannon-road, Brighton.
Engel, Louis, 31, Grosvenor-street, W.
Eykyn, Roger, 13, Upper Grosvenor-street, W.
Hammond, C. D., M.D., 11, Charlotte-street, Bedford-square, W.C.
Heaton, Charles, Bradford-house, Bolton.
Hill, John, 19, Tavistock-square, W.C.
Holtum, William, Church-street, Walmer.
King, William D., 148, Queen-street, Portsea.
Lewal, Gabriel, 5 and 6, Philpot-lane, E.C.
Martin, Henry A., 64, Berwick-street, Oxford-street, W.
Robinson, Vincent J., Douglas-villa, Carlton-hill, N.W.
Rogers, E. S., Victoria Oil Works, Collyhurst-road, Manchester.
Schiele, C., 2, Clarence-buildings, Booth-street, Manchester.
Sturman, Edward Albert, Camden-house, Sydenham-park, S.E.
Weatherley, Christopher, 39, High-street, Wapping, E.
Yates, W. S., Stamford-street, North-street, Leeds.

And as honorary corresponding member.

Kelaart, William Casper, Trinidad.

The Paper read was—

ON THE ECONOMIC VALUE OF FOODS, HAVING SPECIAL REFERENCE TO THE DIETARY OF THE LABOURING CLASSES.

By Dr. Edward Smith, F.R.S., Assistant-Physician to the Hospital for Consumption, Brompton.

Preliminary Observations.

The subject of dietary, although in a limited sense a popular one, is not considered with serious attention either by the thinking classes and their exponent, the press, or by the great masses of the population. Everyone, in appealing to his own experience, is conscious of what diet suits him; every housewife knows what is the best arrangement of food for her household, and every governor of a prison or of a workhouse is confident that the dietary under his control is the best that could be arranged, although there are several hundreds of them, and most of them differ from each other. Hence, when everybody knows all about the subject, and much more than anybody can tell them, what wonder that so little progress is made either in the science or practice of dietary, or that auditors for the most part come in the expectation of hearing their own opinions confirmed. And no doubt there is much truth in the knowledge derived from personal experience and general observation; its defect lies in the absence of any large guiding principle, and in the imperfect, or, perhaps erroneous, deductions which are drawn from it.

At this point, however, exact scientific knowledge should be allowed, if it exist, to aid general observation and to give sounder bases for the conclusions which may be drawn—to render exact and logical that which must otherwise be at the best approximate and probable. But scientific knowledge is necessarily of slow growth, and in this country especially, where scarcely any provision is made for its pursuit, must be attained only as the result of great personal labour and immediate sacrifice, and hence science has not lent that aid which the need of the subject demands. Indeed, almost all that we know has been derived

own generation, and even now we have more to enable us to pull down than to build up.

...ever, the world is under the greatest obligations to chemists, and particularly to Baron Von Liebig, for increasing knowledge, for definitely directing knowledge, and for wide generalizations upon this subject; and now that physiology is lending her aid to chemistry, and there are those who make original researches upon this subject their especial study, we are perhaps not unprepared to treat some of the questions involved in that of dietary upon a sound and final basis.

I have undertaken to treat of that part of the subject which refers to the economic value of foods, but in especial reference to a class of persons not one of whom is present, and to not one of those present can it personally be of much importance. The desirability of a knowledge of the cheapest food will be regarded very differently by different classes, as the subject in debate may be whether for dinner there shall be turtle soup or ox-tail soup, or whether it shall be dry bread or bread and dripping. The class who will discuss the first question may be left to their own discretion, for if they should err it would simply lead to waste, which from their abundance they can afford, but the class to whom the latter is a serious matter of debate demands all our consideration. It is because the latter represent in a somewhat exaggerated degree the great mass of our countrymen, and therefore that my subject is a national one, that I bring it forward here. Perhaps no persons are more ignorant on this question than the well-fed class (as to none is it of so little moment), but the well fed class is the influential one in relation to those below it, and as to this lower class the subject is of vast importance, it is the duty of the higher to make themselves acquainted with the knowledge and to communicate it to others. Governments in constitutional countries are said to be behind public opinion, and not to move until urged on by a generally acknowledged public want. But on this matter our own government is in advance of the people, for they have instituted, for the first time in this or any other country, a scientific inquiry into the exact dietary of the great masses of our countrymen, obtaining, in fact, the national dietary—and have already issued information upon the subject of this paper in the 5th report of the Medical Officer of the Privy Council. Hence, I trust the subject will be considered to have its proper place here—before the largest society of thinking men in this kingdom.

Bases of Economical Value of Foods.

The economic value of foods depends upon two circumstances, viz.: the price paid for them, and the nutriment which can be obtained from them; and in reference to each I will offer a few preliminary observations. As to the first, I remark that as a rule, the price of all kinds of food, except vegetables, milk, and bread, is greater in our small villages and hamlets than in towns, and that in large towns, and particularly in London, food may be purchased at the lowest possible price in this country. In villages the tea is dearer than in towns by from ½d. to 1d. per ounce; sugar by ½d. to 1d. per lb.; flour by 2d. to 4d. a stone; bacon, 2d. a lb.; meat, 1d. to 2d. a lb. for the cheaper joints; butter, 2d. to 6d. per lb. In reference to some of these the difference of price is absolute, but as to others it depends upon the fact that only one quality can be purchased, and with regard to the same food there is no correspondence between their nutritive and marketable values. Thus the cheapest joints of meat, as the breast of mutton, which are sold at so low a price to the poor in London, are not sufficient in number for the inhabitants of a village, and consequently a higher price is paid for them by some, and the better and dearer joints must be purchased by others. So also with regard to bacon—the cheaper kinds are not generally offered for sale, and the poor must pay 8d. and 10d. per lb. for all that they would obtain. Salt butter is rarely to be found in hamlets, but the poor must pay 1s. 5d. and 1s. 6d. a lb. for fresh butter at the end of summer and during the winter. The greater number of persons who can buy the best joints in London enables the dealer to sell the inferior joints cheaply, and with regard to almost every kind of food so much variety in part and quality is offered, that the poor can select the cheapest. It is singular perhaps, that whilst flour is always dearer in hamlets, bread is now nearly as cheap, and in some places cheaper, than in large towns. It is, however, only of very late years that this great advantage has been conjoined with good quality, and it is perhaps the most striking feature of our times, in reference to dietary, that even in remote hamlets cheap and good bread is universally attainable.

Another question in connexion with price is that of credit. Those who are in debt with a dealer must continue to deal with him until the debt is paid, and the latter is compelled in his own interest to charge a higher price for his goods; hence even the bread is charged ½d. a loaf higher, and every kind of food feels the influence of this evil. Many may not be aware to what extent this practice exists, and how effectually it prevents the poor from proceeding to the best market. It is a practice so general among the really poor as to be almost universal, and of necessity it is the most general when the income is uncertain, and the payment of wages made fortnightly and monthly. How great a help would it be to a thrifty family if some less necessitous neighbour would advance them a week's wages, and thus enable them to buy where the goods are the best and cheapest.

As to the exceptions which I have mentioned, it must be borne in mind that vegetables, when bought in villages, are not cheap, and that milk in the neighbourhood of large towns is as dear as in the towns themselves, except that inferior kinds, as skimmed milk and butter milk, may be had in the former place only, and hence in these foods the poor in the villages may have no advantage. But, without entering more at length into this, the most self-evident part of our subject, I wish to impress upon your minds the fact that, upon the whole, the poor of our villages pay more and obtain worse food than in this great metropolis.

The amount of nutriment which can be obtained from any given food depends upon the nutritive elements of which it is composed and on the use which the body can make of them. Thus, the bark of trees and sawdust in chemical composition contain much of the elements of nutrition, but as the stomach cannot digest much of them, they would not be an advantageous food at any price. It is at this point that deductions from chemical knowledge alone have led, and I must add, are still leading, to error. Nearly all the generalisations of Liebig on the nutritive value of food were based simply upon their chemical constituents, assuming in a general manner that they would all be equally well digested and appropriated by the system. That this too hasty generalisation should have been made many years ago, cannot be wondered at, seeing that both chemical and physiological knowledge was then most imperfect, and that the authorities were chemists only; but that men of repute should, even to the present week, publish knowledge of this kind, and even take credit for it, is much to be regretted. So strong a hold do the impressions of our earlier years take upon our minds, whether they have been derived from our own observation or from the books by which we were educated. It is still not at all generally apprehended, even by good chemists, that on questions of food we must ascertain in what degree the system can appropriate foods before we can venture to affirm their relative nutritive qualities from their relative chemical composition. As I attach great significance to this fact, and shall have to apply it as we proceed, I am particularly desirous that it should not be forgotten. The question is not what nutritive elements food possesses, but how much nutritive matter the body can obtain from it. Hence, a food is economical as the body can obtain from it the largest amount of nutriment at the least cost. In proceeding to apply these general

principles to the individual articles of food, I must select those elements essential to nutrition, and also name some price which shall be regarded as a standard of cost.

Nutritive Elements Selected.

As to the elements of food, I propose to select the carbon and nitrogen only, since they alone can be collected as they leave the body. If I were treating of the nutritive value of food in a chemical aspect only, apart from any daily measure of the amount required by the body, I should add the free hydrogen also, since with its combination to form water within the body it must generate heat; but we have no means of ascertaining how much heat is produced and required by the body; neither can we ascertain how much of the water which leaves the body is generated in this manner, and how much is due to that which was taken as food. Hence, in seeking to ascertain how much nutriment is required by the body, we must altogether omit any reference to this element, and must restrict ourselves to the carbon and nitrogen, for as the latter in leaving the body can be measured, they give the best indication as to how much is required to supply their place. This is the only practicable basis for dietary in a physiological point of view, and hence my object is to show in what way the largest amount of carbon and nitrogen can be obtained at the least cost.

I wish I could select terms which would be less technical, and yet be at the same time exact, but I cannot. An attempt to do this has been long made, and this also on purely chemical grounds, by calling some elements heat-givers, and others flesh-formers, as though the two had quite distinct actions; but it should be understood that in all the important foods, excepting fat, and sugar, both these classes are always found in the same food, so that bread and meat are heat-givers and flesh-formers; and it has been also proved, by the experiments of Messrs. Lawes and Gilbert, myself, and others, that nitrogen—the flesh-former—passes through the body every moment without forming flesh, and therefore cannot always be a flesh-former, and that, whilst in the body, it stimulates vital action, and promotes the change of the heat-givers, and is therefore indirectly a heat-generator. Hence physiology has again shown that the clear lines of distinction drawn by chemists and chemistry are incorrect, and lead to error. It is probable that in every case the one kind of food assists the digestion of the other, and it is certain that no such division as heat-giver and flesh-former can now be tolerated, except in a general and popular sense. It is also necessary to add that I cannot treat of them collectively, or say that a food offers so much nutriment, for these two elements are required by the body in different proportions, and foods differ in the relative quantity of each which they contain.

Hence I must speak of the two elements simply as carbon (the so-called heat-giver), and nitrogen (the so-called flesh-former), and it will not be difficult to follow all that is to be said respecting them without any chemical knowledge whatever.

Separate Foods.

Bread.—I purpose to consider bread as the first and basal element of dietary, both from its extreme importance in relation to the whole dietary, and from its universal use in this country. This may be made of white wheaten flour, brown wheaten flour, rye or barley, or an admixture of these substances. 1 lb. of white wheaten bread, made of household or seconds flour, is worth from $1\frac{1}{4}$d. to $1\frac{1}{2}$d. in different parts of the country, and the most frequently $1\frac{3}{8}$d. or $5\frac{1}{2}$d. per 4 lb. loaf. 1 lb. of bread contains 1,994 grains of carbon, and 89 grains of nitrogen, or, in round numbers 2,000 grains and 90 grains, and as the cost is $1\frac{1}{4}$d., $1\frac{3}{8}$d., and $1\frac{1}{2}$d., the quantity for each 1d. will be as follows:—

	Carbon Grains.	Nitrogen Grains.
At $1\frac{1}{4}$d.	1,600	71
„ $1\frac{3}{8}$d.	1,450	66
„ $1\frac{1}{2}$d.	1,303	60

I will take the middle quantities as my standard, since it will apply more largely to the country than any other, and will consider that 1,450 grains of carbon and 66 grains of nitrogen are obtained generally for 1d. spent in white bread.

The above has reference to the quality known as households. When a whiter flour is used, if there be no adulteration, the cost is increased, not only because the manufacture of the flour is more costly, but because fine white English or Gennessee wheat is used, which is dearer than red wheat; but there is no evidence to show that the nutritive value is increased, except in the case of wheat selected which is grown in hot climates, and which contains somewhat more nitrogen. Taking the increased price of 2d. to 4d. a peck of flour into account, this flour is the dearer food. But it is largely the practice, and particularly in the French flour, to add rice to the very white flour in order to improve the colour, and in so doing a reprehensible adulteration of the flour occurs; for, taking the price of fine flour and rice at 2d. per lb. each, the amount of carbon and nitrogen for 1d. would be:—

	Grains.		Grains.
Flour, Carbon...	1330	Nitrogen...	60
Rice, „ ...	1380	„ ...	35

so that with a trifling increase in carbon the amount of nitrogen has been reduced nearly half. But in truth the loss is greater, for the value of the rice does not exceed 1d. to $1\frac{1}{4}$d. per lb., and the difference between that and the selling price of the flour is to the gain of the miller and the loss of the consumer. There cannot be a doubt that it ought to be as penal to adulterate flour with rice as to mix chicory with coffee, and the law ought to require from the seller the same affirmation of the admixture in both cases.

Now to turn to the other aspect of the question. What is the effect of retaining in or of adding to the flour the bran as a whole or in part. In this matter there is a fallacy which was originated by chemists; and now that bread companies are doing a large trade, and have medical men upon their direction, who quote and scatter medical opinions, the fallacy is revived, but there is no fallacy on the part of the masses of the people. The use of white wheaten flour is extending as rapidly as possible in the western world of America (the home of the Maize), and even in the poorer districts of the world the dark-coloured bread is not the brown bread of this country, but barley or rye bread in whole or in part. The millions of this country cast aside the bran, and in doing so follow the dictates of experience, of far greater value than theoretical reasons derived from a single scientific fact, and such assertions as that of Dr. F. W. Headland, in his Medical Handbook: "This is one of the matters in which the world has gone grievously wrong;" and also that of Dr. Mapother, who, in an interesting paper lately read in Dublin, remarked: "We are receding in the art of dietetics in regard to whole-meal bread, for up to some forty years ago it was most generally used in these countries." In these assertions the terms have been inverted, and instead of testing the truth of scientific statements by universal practice they presume to set universal practice at nought, when compared with inductions which themselves can only properly flow from practical experience.

The question then is—Is brown bread cheaper than white bread in the nutrition of the body? By brown bread is universally understood the admixture of the bran, in its entire composition, with the farina of the flour, and not the exclusion of the outer husk of the bran and the retention of the inner layer. This must be understood, or the statements of persons cannot be compared, neither shall we treat of bread in actual use.

Dr. Dundas Thompson was one of the earliest authorities on this subject, and in lectures now publishing he writes as follows:—

"It is important that we should be able to analyse bran

in order to be capable of appreciating the ground upon which it has been long known that this substance is alimentary, and that to remove it from flour is to deprive flour of a large amount not only of nutriment, but of meat-producing principles. It is well known, both by physiological and chemical research, that oatmeal contains more nutritive matter than any other of the cerealia. This may no doubt be in some measure due to the imperfect manner in which the bran is separated from the flour. We may truly consider these infallible physiological results which are obtained in the history of such people as enjoy robust health and longevity with oatmeal as their staple article of food; and when chemical analysis confirms these experiments, our conclusions seem to be deduced from a powerful species of induction."

Again, he writes, "I am not aware that the nutritive superiority of brown to white bread was known upon scientific data prior to the year 1843, when the writer showed that the per-centage of nitrogen in white bread (freed from water) was $2{\cdot}27 = 14{\cdot}8$ nitrogenous principle, while that of brown bread containing bran was $2{\cdot}63 = 16{\cdot}43$ nitrogenous principle."

Thus because bran contains more gluten and less starch than the inner portion of the wheat, it was assumed that it was more nutritious. This statement has been handed down and copied from book to book up to this day, so that in the book of Dr. Headland just quoted we find:—

"This husk contains more gluten, more nutritious matter, than the whole interior, the proportion being in the husk about 17, in the seed about 12 in 100 parts. White bread is not only more expensive, but is far less nutritious than flour in which the bran is ground. Yet the poor as well as the rich prefer white bread. The former even consider the recommendation to eat brown bread as a sort of insult. This is one of the matters in which the world has gone grievously wrong." Dr. Guy, who quotes this passage, remarks in the text of his paper on dietaries, read before the Statistical Society, "that we can make a considerable addition to the gluten and the oil by adding the bran to the flour; or making the bread of whole meal obtained from the grain either before or after the modern process of decortication." He also adds a table, to show that bran contains 8 per cent. more gluten (which is about $1\frac{1}{3}$ per cent. of nitrogen), and 9 per cent. less starch, &c.

Dr. Johnston, in his "Chemistry of Common Life," also writes, "Bread made from the whole meal is therefore more nutritive;" but he adds another chemical statement to that already mentioned, viz., that "the bran of wheat possesses also the property of dissolving the flour or bread with which it is mixed, and of rendering it more easily digestible in the stomach." He seems to regard this as an advantage, and a more recent authority makes the following remarks:—

"The conversion of the starch into dextrin and sugar likewise renders the bread darker in colour. In fact, the brown colour of wheaten bread made from flour containing fine bran, is due, not to admixture of particles of bran, but in great part at least to a conversion of the starch into dextrin and sugar by the action of the altered albuminous matter in the bran. According to Mège-Mouriès, bran contains a peculiar nitrogenous body called *cerealin*, which is specially active in inducing this conversion: it appears, however, to be identical or nearly identical, with ordinary diastase. Be this as it may, it is certain that the finest wheat flour obtained from the central portion of the grain, which contains but little nitrogenous matter, has very little tendency to undergo the change under consideration; but coarse flour obtained from the exterior of the grain is rich in azotised substances, and more ready to undergo the glucosic deterioration. In white bread of good quality, the starch has undergone very little alteration. A small portion of it is rendered soluble in water, but the greater number of the granules are simply swollen, not burst, and may be washed out of the bread, collected, and weighed." —*Watts' Dictionary of Chemistry.*

Hence, the arguments on this side of the question are, that as the bran contains more nitrogen than the farina, and as there is a principle in bran which, acting as a ferment, aids in the conversion of starch into dextrin and sugar, brown bread is more nutritious than white bread.

Now, what does the fact amount to? An average sample of wheat will yield one fourth to one-fifth of its weight of bran, and so far whole meal, or brown flour, will contain more nitrogen and less carbon than white flour. The estimate of the contained nitrogen in bread, as made by Dr. Thompson twenty years ago, on Prussian bread, is higher than is applicable to the bread of this day, for instead of being 2·27 per cent. dry, or 1·59 per cent. fresh, it is now only 1·3 per cent. fresh. But if we accept the relative statement as to the respective quantities of nitrogen in the white and brown bread, we shall find that the increase in 1 lb. of brown bread is about 20 grs., whilst the carbon is reduced. As to the latter assertion viz., that the cerealin of the bran aids the conversion of the carbonaceous elements, as the action is deteriorating, it can be useful only as it is necessary. But both statements alike ignore the action of the living body, and assume that the nitrogenous fluids of the body are insufficient to provide the starchy and saccharine transformation, and also that the nitrogen in the bran will be appropriated as freely as that of the farina, and thus, upon an assumption of these, which are the essential facts, the inference that brown bread will be more nutritious, is drawn. That is "begging the question." Moreover, it is well known that the body itself furnishes a substance which, acting like a ferment, procures the conversion of the starch into sugar, and there is no evidence to show that the converting property of the cerealin is as necessary to digestion as it is deteriorating in the destruction of nutritive matter.

Let us now see what can be said on the other side. Dr. Prout is quoted by Dr. Guy in support of this brown-bread nutriment theory, but with singular infelicity, for Dr. Prout, instead of regarding bran as nutritious, terms it excrementitious. Thus he is quoted by Dr. Guy:—"Bread, therefore, made with undressed flour, or even with an extra quanty of bran, is the best form in which farinaceous and excremental matter can be usually taken, not only in diabetes, but in most of the other varieties of dyspepsia, accompanied by obstinate constipation. This is a remedy, the efficacy of which has been long known and admitted." Hence, he regards bran as a remedy for constipation, which nature has conjoined with food, and therefore denies that it is food, or directly adds to the nutriment of the bread; and in this view of the action of bran he is joined by the medical profession generally—by the poor, who have used it and ceased to use it—and by the rich, who need a remedy for constipation. This question is now of the greatest interest (otherwise than as a commercial one) in reference to prison dietaries, and, when under examination before the Committee of the House of Lords, this year, in answer to the question (No. 988), "Will you state what sort of bread you would recommend?" I replied, "I think it essential, for prison diet, that it should be white bread, or if not white bread it should have the bran ground finely. My reason for this is, that I and others have shown that the bran of brown bread—as the husk of oatmeal and the shells of peas—hastens the nutritious material through the bowels. We therefore have a larger waste of food if we give the bran with the bread, and the husk with the oatmeal, and the shells with the peas, than we should without them." When these words were read to Dr. Guy, the other scientific witness, at his examination before the same Committee, and question put by the Chairman (No. 3,796), "Would your experience enable you to confirm that statement?" the reply is, "Yes; I should agree with that statement. If whole-meal bread were found to produce diarrhœa, I should expect it to prove less nutritious." In answer to a former question (No. 3,789), "Is there any objection to using all that there is in wheat?" the same authority replied, "I think not;

but that must be a matter of experiment. If it were found that by continuing brown bread for a long time, diarrhœa was occasioned, it might become necessary to substitute white bread on certain days of the week, but brown bread should be used as much as possible."

Thus the excremental quality of the bran is, I may say universally, admitted, and if in its full action it will purge, in its less and more constant action it will tend in the same direction, and cause more frequent and free removal of material from the body than occurs with white bread. But this latter action, which had not been estimated, has been established by the experiments of Mr. Milner and myself, as a Committee of the British Association appointed to make inquiries into the influence of prison punishment and dietary over the bodily functions of prisoners, which are very extended, and as they are the only similar ones on record, I must refer to them to prove that under the influence of the brown bread dietary, the waste by the prisoners was more than twice as much as that occurring in ordinary life. Hence here is a food inducing an action which, in its full effect, is one of disease, and is to be restrained, and, in its less effect, causes the removal of double the amount of nutritive elements from the body which occurs without it, which is recommended by medical men, and taken by the richer classes as a remedial agent to remove constipation, and hence, of necessity, must increase the waste of food, but still it is affirmed to be more nutritive, because it is ascertained out of the body to contain a larger quantity of a chemical element, which, if used by the body, would afford nutriment. Such are the hasty deductions upon which this theory has been based; and Dr. Guy, in his evidence just quoted, and in answer to the question No. 3788, "Why would you prefer brown bread?" replied, "the only bread used in prisons should, I think, be brown bread, partly because it is more nutritious and contains more of the muscle-making element in it (the nitrogen which has been spoken of) than white bread does." But how much further, let us ask, can this *non sequitur* be carried when it is known that the bran itself passes out of the body unchanged, as may be ascertained by any observer, and as was proved by us in our analyses daily for two months in prisons—this wonderfully nutritive material, which contains so much of the muscle-making element, and which must, besides, have the faculty of being in two places at the same time!

The proper place in which the action of bran should be arranged is manifestly that of a medicine (and it would be easy to show that it is a bad one), as stated by Dr. Prout, and as practised by mankind, and therefore to be used when constipation occurs, or when, as is commonly the case, this is accompanied with the excess of food to which the well-fed and under-worked classes are accustomed. Hence, when I was asked by the Committee before-mentioned, No. 987, "Then the general prejudice which prevails amongst the agricultural community that the finest white bread is the best for them, and the most nutritious, is correct," I replied, in language not my own, "Certainly, it is correct. Brown bread is the rich man's and not the poor man's diet." I thought this necessarily followed from the statement of the action of the brown bread, which had been given in answer to No. 988, and assented to by Dr. Guy, in answer to No. 3,796 already quoted; but when my answer was read to Dr. Guy, No. 3,797, he replied, "I do not agree with that view of it; I think brown bread is especially the poor man's dietary, not the rich man's. I should reverse that answer." So that the poor man, who can scarcely obtain food enough to keep body and soul together, must for his own good take that kind of bread which is less agreeable, and will cause more waste of his food in order to be consistent with a single fact in science. It is clear that science and bran together would be the death of him, only that his own experience had taught him to cast both aside, to leave the physic to them who can afford to take it.

It is, perhaps, unnecessary to proceed further in the matter, or I might adduce the experience of persons in feeding horses and pigs with the bran and the inner husk of wheat, or sharps. When a bran mash is given to a horse it is given as a medicine, and no one who has had the least experience in feeding pigs would give sharps—the highly nutritious inner husk of wheat!—instead of barley meal, which contains so much less nitrogen. Moreover, the price of the bran and sharps indicates the estimate which is formed of their nutritive values. Thus:—

1 bushel of	seconds flour,	weighing	56 lbs.	costs	7s. 9d.
,,	bran	,,	12	,,	9d.
,,	coarse pollard	,,	14	,,	10d.
,,	fine pollard	,,	18	,,	1s. 0d.
,,	sharps	,,	26	,,	2s. 0d.

I have entered at length into this question on the ground of its importance, both in a scientific and social point of view, and I trust that we shall assent to this conclusion, that, at equal cost, brown bread is dearer than white bread, and from its medicinal action should be used intermittingly and not continuously (if used at all), and should not be used by the poor man. The relative values when difference of cost occurs must depend upon the amount of difference. Years ago white flour was from 2d. to 4d. a peck dearer than brown flour, but the quantity of the latter which is now made is so much reduced, that when wheat of equal quality is used there is no difference in price in some localities, as in London, and but little difference in country places. Hence there is now nothing in favour of its use by the working classes, but if a large sale of it at the present high prices could be effected, the bakers, buying it in large quantities at a cheaper rate, would make larger profits by it.

Barley bread is much inferior to wheaten bread in the amount of nitrogen which it contains, but it is so much cheaper that, where the flavour and dark colour are not objected to, its use is economical. The meal is sold at 1s. and 1s. 2d. the 14 lbs., and if we take the higher sum, we shall find that 2,500 grains of carbon and 93 grains of nitrogen will be obtained for 1d.

Rye alone is not made into bread at the present day, but it is mixed with wheaten flour to make brown bread. It contains more nitrogen than barley and less than wheat, but both are remarkable for the large amount of indigestible husk which is found in the bread.

As the bread in use in this country is derived from the grains already referred to, it will be convenient to consider here the economy of baking the bread at home. The discussions which have recently taken place in the *Times* have shown that not less than 94 loaves of 4 lbs. each, and one baker admitted that 95 loaves of 4 lbs., could be made from 280 lbs. of flour, not necessarily so that every loaf could be sold at the highest price. The quantity varies with the soundness and highly nitrogenised qualities of the flour and the skill of the baker, so that in numerous experiments made at home, I found that the quantity of bread varied from 19 lbs. to 20½ lbs. from the peck of 14 lbs. of flour. 95 loaves to the sack, and 19½ lbs. to the stone, are equal to the quantity of flour multiplied by 1·4, and whilst the quantity of bread should be somewhat greater, it ought not to be less. Where the 4 lb. loaf may be purchased for 5½d., the flour may be bought retail at from 1s. 10d. to 2s. the peck. If we select the former price we shall obtain 16 lbs. of bread for the same price as 14 lbs. of flour, so that the value of 3½ lbs. of bread (the extra quantity which should be produced from the peck of flour), represents the cost of baking and gain if any. The cost will include yeast, which will vary from 1d. to 1½d., salt, and the cost of the firing, which would not be so much as the balance, 3d. or 3½d. The labour of the housewife need not be taken into the account, and where there is convenience for baking, it is probable that 2d. to 3d. per peck will be saved where fuel is cheap. In London the cost of bakers' bread and flour is nearly the same.

Oatmeal and Indian corn are not baked into loaves, and wherever they are eaten it is most usual to eat them in a moist state. Oatmeal is richer in nitrogen than wheaten

flour, but this is owing very much to the husk, which is not thoroughly removed, and which when taken into the body is not digested. The price of oatmeal is now universally 2d. to 4d. per peck of 14 lbs. higher than that of household flour, so that the gain in the use of oatmeal is lessened. The amount of carbon and nitrogen to be obtained for 1d. when oatmeal costs 2s. 2d. the 14 lbs., is 1513 grains of the former and 75 grains of the latter.

Indian corn, or maize, may be purchased here at the price of barley, and as it contains much more nitrogen and carbon than the latter, it is by far the cheapest food hitherto mentioned. Thus at 1s. 2d. per stone of 14 lbs. there will be no less than 2,800 grains of carbon and 121 grains of nitrogen obtained for 1d.

Rice and Peas.—Rice has already been mentioned, and it remains to speak of peas and beans in connection with this part of the subject, since, whilst peas are usually eaten after boiling, there are parts of the country where they are added to other foods in making bread. Split peas may be purchased at 1½d. per lb. retail, and at that price will yield 1820 grains of carbon and 170 grains of nitrogen for 1d. Hence in the latter particular, they far exceed in economy all the foods already mentioned. It must however be stated that this analysis refers to whole peas, and assumes that the whole will be ground into meal, but when they are boiled the shells are indigestible, as has been already pointed out, and lead to waste of food. Hence, although split peas are somewhat dearer, it is probable they are more economical.

The foods which are thus associated offer a wide range in their relative economy, so that some have twice as much carbon and others twice as much nitrogen as the standard quantity found in bread, and in relation to the same monetary value and in their effect upon the system would probably differ but little from that proportion. Hence it may be asked, "Why is it that the cheaper foods are not universally selected." The answer must have reference to the income and the tastes of the people. So long as good wheaten bread can be obtained its approved flavour will commend it, whilst other and cheaper foods will only be used as adjuncts. It is only as the real wants of the system are greater than the income spent on bread will supply, that unusual and less agreeable foods, as peas and beans, barley, rye and maize, will be accepted. In all these discussions a practical as well as scientific view must be taken, and to the destitute class only can we commend the use of such foods with success (and only then as a temporary expedient), whilst any general attempt to enlist the sympathies of those who can purchase white bread will certainly fail.

Fresh Vegetables.—Potatoes will be dear or cheap as they are purchased or grown, and therefore their value will be differently estimated by persons occupying the two positions. Moreover, when they are purchased their cost varies much at different seasons and in different parts of the country, so that it will not be easy to obtain an approved standard for our calculations. I purpose to select ½d. per lb. as a medium cost, and at that price 1540 grains of carbon and 49 grains of nitrogen, would be obtained for 1d., but as the price is often 1d. per lb. in London and other large towns, only one half of that quantity would be then purchased for 1d.; hence their inferiority to the standard quantity in reference to nitrogen is very striking, and at either price they are dear food.

Other fresh vegetables may be classed together, and if we consider that 2 lbs. in weight could be purchased in London and large towns for 1d., and 4 lbs. in country villages for the same sum, we shall find that the carbon and nitrogen obtained would be respectively 820 grains, and 1640 grains of the former and 28 grains or 56 grains of the latter, and hence would closely correspond with the nutritive value of potatoes when purchased at ½d. per lb.

When potatoes and green vegetables are grown by the consumer, their cost is represented only by the rent of the land and the manure, and often by the former only, for manure is often collected, and the planting and gathering of the crops effected by the labour of the family, and as that labour could not be otherwise profitably employed, the potatoes add to the wages of the family, or are obtained almost without cost, as the question may be regarded. Such persons have great advantages over those who must buy their food, and exhibit a real economy in extending the use of fresh vegetables as far as their appetite and health or their means of production will allow.

Fats are allied to the class of foods now discussed, in that both constitute the chief supply of carbon to the system, but they differ in offering no nitrogen. They also contain much free hydrogen, which is useful to the system, but for the reason already given I shall refer only to the carbon. Those fats which are in common use, when separated from other foods, are butter, lard, dripping, and suet. The prices differ greatly, and particularly that of butter, so that I must take a medium, and shall select 1s. 2d. per lb. for butter, 9d. per lb. for lard, 6d. per lb. for dripping, and 7d. per lb. for suet. At these prices the following are the quantities of carbon which can be obtained for 1d.: — Butter, 327 grains; lard, 591 grains; dripping, 886 grains; and suet, 657 grains. Hence butter is by far the dearest of the fats, and dripping the cheapest, whilst the average of the whole is not nearly half of the standard quantity of carbon, omitting any reference to nitrogen.

Sugars, like fats, yield no nitrogen, but supply carbon largely. The two kinds are sugar and treacle, each having much variation in price, but little in nutritive value. I propose to consider sugar to be worth 4½d. per lb., and treacle 3d. per lb., and at these prices the quantity of carbon afforded by them at the cost of 1d. is, sugar, 622 grains, and treacle, 746 grains. Treacle is thus the cheaper, but its use is more limited than sugar, and could not supplant the latter. The relation of the nutritive value to the standard in bread is almost the same as that of fats, and both are dear foods as compared with the standard. It is also seriously doubted whether the elements of which sugar is composed can be rendered equal in nutritive value to the same elements in fat; and, although this cannot be determined at present, it seems probable that the absence of sugar in a dietary would be less important than the loss of an equivalent value in fat.

Meats.—The determination of the exact economic value of meats is a work of great complexity, owing to the different kinds and joints of meat which are used, containing very different relative quantities of fat and lean, and the valuable flavoured juices of the meat. All contain both carbon and nitrogen, and these will vary as the fat and lean vary. As a general expression, it may be stated that in point of cost, beef and English bacon are the dearest, whilst American bacon, mutton, and pork are the cheapest. In reference to the nutritive elements, bacon, pork, mutton, and beef have the greatest quantity of fat, beginning from the first, and will therefore be richer in carbon than beef, whilst the latter will exceed the others in nitrogen. If we consider that the average price of beef is 7½d., of mutton and pork 7d., of English bacon 8½d., and of American bacon 4½d., we shall find the following quantities of each to be procured for 1d:—

	Carbon.	Nitrogen.
Beef	320 grains	23 grains.
Mutton	415 ,,	20 ,,
Pork	483 ,,	18 ,,
Dried English bacon	510 ,,	12 ,,
Wet American bacon	918 ,,	17 ,,

Hence the quantities of carbon vary from 320 grains to 918 grains, and of nitrogen from 12 grains to 23 grains, so that when compared with the standard they are deficient by two thirds.

A communication addressed to me by the Consul of Uruguay led me to expect the receipt of specimens of dried meat from South America, which, after examination and consideration, I might have included in my list of foods, but the parcel has not yet arrived.

Time does not permit me to consider the propriety of

admitting or rejecting the flesh of animals which have died from accident or disease (thence often misnamed diseased meat), and which is sold cheaply. There is a natural repugnance to the use of this food, and yet it has been eaten in various parts of the country in all ages, as for example the braxy mutton of Scotland, and veal from calves dying natural deaths in Wales, and no evil has been traced to it. So also with animals dying from accident, such as suffocation on board ships in a storm, or by acute inflammations, it has not been shewn that any change has taken place in the flesh, which, when eaten, would produce unhealthy nutrition. The case is far different when the animals have been long ill, or when the disease has been a specific one, which could in other ways have been transmitted. As there is not time to discuss this important question properly, I should regret saying anything which might lessen our repugnance to the use of the flesh of animals dying from any disease, but I am of opinion that some of the denunciations which have recently been hurled against them are not supported by known facts, and that in the interests of science as well as of justice nothing should be asserted which cannot be supported by proof. As there could not be any means of distinguishing the meat of animals dying of different diseases (except in a few cases), it is only at present practicable to wholly admit or wholly exclude it, and the latter is doubtless the safer plan.

There are two substances in reference to meat to which I must further refer, viz., liver and bones. There is a scientific prejudice against the use of liver on account of the frequency with which it is diseased, but when it is cut into thin slices and no disease is evident to the eye, it is only necessary that it be well cooked. It is an economical food, for if it cost 3d. per lb. it will yield 410 grains of carbon and 70 grains of nitrogen for 1d.

Bones are used by every housewife, if she have them, when she makes soup or broth, and yet there is a scientific prejudice against them because an inquiry made by "The Gelatin Commission" in France many years ago, proved that animals could not live on bones alone. Here again we have a hasty generalization, for whilst the conclusion just mentioned was proved, it was not shown that bones may not be advantageously used as a part of the dietary—yet from that conclusion and the further fact that the residue of digested (or boiled) bones consists largely of gelatin, arose the assumption that gelatin was not nutriment, yet medical men order jelly for sick diets, and everybody who can obtain a jelly, if it is nicely flavoured, enjoys it, and all have the impression that it nourishes. Moreover, in my experiments I proved that when jelly had been eaten the emission of nitrogen was increased—thus showing that the jelly had been absorbed and converted into other substances; yet, with the habit of writers to hand down that which has been written, the writers on diet of to-day deny the nutritive value of gelatin. As bones cost about 1d. per lb. and when cooked may be sold again for a ½d. per lb., the analysis which I made for the Government proved that 1d. worth of bones well digested gave 1566 grains of carbon and 48 grains of nitrogen, so that I trust science will not prevent your using them.

Fish.—Of fish I shall refer only to herrings, since it is impossible to fix a uniform price to that article of diet. If we take a dried herring of the size sold at three-farthings each, and a fresh one sold at one half-penny each, the following will be the amount of carbon and nitrogen per 1d.

	Carbon.	Nitrogen.
Dry	352 grains	54 grains.
Fresh	480 ,,	72 ,,

The size will vary with the state of the market, but fresh herrings are more economical than dried herrings at the price named, and, whilst greatly below our standard in carbon, approach it very nearly in hydrogen.

Milk.—Milk is used as new milk, skimmed milk, and butter-milk. These differ extremely in the price paid for them, but they approximate closely in the nutritive elements which they contain, for skimmed milk differs from new milk only in having lost the butter, and butter-milk from skimmed milk only in having lost a portion of its sugar and gained a portion of acid. Hence, skimmed milk and butter-milk may be rendered nearly equal to new milk by adding a proper quantity of fat to them.

I do not think that a medium price can be selected for each of these kinds of foods, since they are purchased at the different places at different and yet fixed prices, over large areas of the country, but I will name the following:—New milk, 1d. and 2d. per pint; skimmed milk, ¼d., ½d., and 1d. per pint; and butter milk, ⅙d. and ½d. per pint. At these prices the following quantities of the elements may be obtained for 1d.

		Carbon.	Nitrogen.
New milk	1d. per pint	546 grains	44 grains.
,,	2d. ,,	273 ,,	22 ,,
Skimmed milk.	¼d. ,,	1,748 ,,	174 ,,
,,	½d. ,,	874 ,,	87 ,,
,,	1d. ,,	437 ,,	44 ,,
Butter milk	⅙d. ,,	2,514 ,,	262 ,,
,,	½d. ,,	838 ,,	88 ,,

If we select skimmed milk and butter milk at their lowest price, we find that they exceed the standard in carbon, and are very much richer in nitrogen. Even buttermilk at the highest price, and skimmed milk at its medium price, are higher than the standard in nitrogen but deficient in carbon, whilst new milk at the highest price is somewhat dearer than beef, and incomparably dearer than the standard. As the cost of milk cannot be varied by the purchaser, but each person must in his own locality pay the price demanded, it is easy to perceive how much more highly-favoured some portions of the community are than others, and how unfavourably the inhabitants of this metropolis compare with those of small towns and villages. How absurd also is the frequent habit, even among the poor, of regarding butter milk as a food for pigs and not for man.

Whey.—Whey is nowhere sold by farmers I believe, and in but few places is it regarded as a food worthy of man. It is not a rich food, for nearly all the cheese and butter have been extracted in its production, but yet each pint contains nearly 200 grains of carbon and 15 grains of nitrogen, so that it is much more economical to drink whey than water.

Cheese.—Cheese is a substance particularly rich in nitrogen, and the poorest kinds of it, namely, those made from skimmed milk, contain the greatest amount of this element. It is very probable that the only real difference between skimmed milk cheese and new milk cheese, is in the absence of butter in the former, and its presence in greater or less quantity in the latter. Hence the latter will be richer in carbon, besides being more agreeable to the palate. There is a great difference in the value of these kinds of cheese, so that whilst skimmed milk cheese is obtained at 3d. per lb., it is needful to give 8d. for a fair sample of new milk cheese; and accepting those prices we shall find the amount of carbon and nitrogen which can be obtained for 1d. as follows:—

	Carbon.	Nitrogen.
Skimmed milk cheese	7?2	122
New milk cheese	333	40

The difference in the economic value of the two kinds is exceedingly great, but it is not known whether both are equally digestible and appropriated by the system. It is highly probable that when more than half an ounce of cheese is eaten at a meal a considerable portion passes off unused, for in my experiments the amount of nitrogen which enters the blood when two ounces of cheese had been eaten was far less than was contained in the cheese. Admitting, then, that there is a waste of material whenever cheese of any kind is eaten in large quantities, I doubt if there is any ground for the belief that the cheaper kinds of cheese are less digested than the other, provided the following conditions be fulfilled in both cases, viz., that the cheese be neither new

nor old, but the skimmed milk cheese about 6 months, and the new milk cheese from 6 to 12 months old. If too new, the skimmed milk cheese is tough, and if too old, it is hard and therefore in both cases it will be imperfectly masticated.

When compared with our standard, skimmed milk cheese far exceeds it in nitrogen, whilst both kinds are greatly deficient in carbon, and from this must also be taken an unknown quantity for the supposed loss in digestion. It is a great mistake in the poor to buy high priced cheese, and cheese at whatever price which is strong to the taste.

TEA.—Tea was largely considered by me in the paper* which I had the pleasure of reading before this Society two years ago, and which the council honoured with a medal. It is by far the least economical of all the substances used as food, since if valued at 3d. per oz. it would not give more than 4 grains of nitrogen and an infinitesimal quantity of carbon for 1d. Hence, as affording nutriment, its purchase is most wasteful; and although it is useful by enabling the poor to drink hot water in an agreeable form, it is most desirable that its cost should be reduced to the least possible amount.

ALCOHOLS.—I do not propose to discuss the value of alcohols in this paper, since regarded as food they offer extremely little nutriment in proportion to their cost, and regarded as medicinal agents their worth cannot be measured by the nutritive material which they contain.

SUMMARY.

I have now completed the details which I proposed to lay before you, and, in conclusion, have only to sum up the subject by showing at what cost the standard quantity of carbon and nitrogen may be obtained from the various foods which have now been considered. The standard quantity required is 1450 grains of carbon and 66 grains of nitrogen, at a cost of 1d.

AS TO THE CARBON.

Maize will yield the standard quantity at a cost of ½d. Buttermilk (bought at 6 pints for a penny) and barley meal at a little more than ½d.; peas, green vegetables (costing ¼d. per lb.), potatoes (costing ½d. per lb.) and oatmeal and bones, at from ½d. to 1d. Fine flour, rice, buttermilk (costing ½d. per pint) at from 1d. to 1½d.; green bacon, skimmed milk (costing ½d. per pint); dripping, green vegetables (costing ½d. per lb.); treacle and skimmed milk cheese, at from 1½d. to 2d.; suet, sugar and lard, at from 2d. to 2½d.; new milk (costing 1d. per pint); fresh herrings and pork, at from 2½d. to 3d.; mutton and skimmed milk (costing 1d. per pint), at from 3d. to 3½d.; dried herrings, butter, new milk, cheese and beef, at from 4d. to 4½d.

AS TO THE NITROGEN.

As the relative quantity of nitrogen to carbon is not high in bread, we shall find that numerous articles of food offer the nitrogen at less cost than bread, whilst at the same time the extreme variation from bread is in reference to the nitrogen. Thus, butter milk (costing ⅙d. per pint), will give the standard quantity of nitrogen for ¼d.; skimmed milk (costing ¼d. per pint), peas, and South American beef, at from ¼d. to ½d.; skimmed milk, cheese, and maize, at about ½d.; butter milk and skimmed milk, each costing ½d. per pint, and barley meal, at ¾d.; oatmeal, fresh herrings, and liver, at from ¾d. to 1d.; fine flour, green vegetables (costing ¼d. per lb); dried herrings, new milk, and skimmed milk (each costing 1d. per pint), and bones at from 1d. to 1½d.; new milk cheese, at a little more than 1½d.; green vegetables (costing ½d. per lb.); potatoes costing 1d. per lb.; beef and new milk costing 2d. per pint, at from 2d. to 3d.; mutton, pork, and green bacon, at from 3d. to 4d., dried bacon, 5½d., and tea, at 20d.

These with other facts are contained in the following table :—

* Vol. IX., p. 185.

TABLE, showing the quantity of Carbon and Nitrogen contained in 1d. worth of various foods at the prices annexed, and also the variation from the pennyworth of various foods to supply as much Carbon and Nitrogen as are contained in one pennyworth of bread (the standard quantity).

FOOD.	Costing.	Carbon for 1d.	Nitrogen for 1d.	Variation from cost of 1d. to supply the standard quantity of 1450 grains of carbon and 66 grains of nitrogen	
				Carbon.	Nitrogen.
	d.	grains.	grains.	d.	d.
Bread	1⅝ per lb.	1,450	66	..	...
Fine flour	2 ,,	1,330	60	1·09	1·1
Barley	1 ,,	2,500	93	·58	·7
Rice	2 ,,	1,380	35	1·05	1·88
Oatmeal	1⅘ ,,	1,513	75	·957	·88
Maize	1 ,,	2,800	121	·51	·545
Peas	1½ ,,	1,820	170	·796	·388
Potatoes	½ ,,	1,540	49	·94	1·34
Potatoes	1 ,,	770	24½	1·88	2·69
Green vegetables ...	¼ ,,	1,640	56	·88	1·18
Green vegetables ...	½ ,,	820	28	1·76	2·36
Butter	14 ,,	327	...	4·43	...
Lard	9 ,,	591	...	2·45	...
Dripping	6 ,,	886	...	1·63	...
Suet	7 ,,	651	...	2·22	...
Sugar	4½ ,,	622	...	2·34	..
Treacle	3 ,,	746	...	1·94	...
Beef	7½ ,,	320	23	4·53	2·87
Mutton	7 ,,	415	20	3·49	3·3
Pork	7 ,,	483	18	3·0	3·66
Liver...	3 ,,	410	70	3·53	·94
Bones	½ ,,	1,566	48	·92	1·46
Dried English bacon	8½ ,,	510	12	2·84	5·5
Green American bacon	4½ ,,	918	17	1·58	3·88
Dried herrings ...	¾ each.	352	54	4·1	1·22
Fresh herrings ...	½ ,,	480	72	3·0	·91
New milk	1 per pint.	546	44	2·66	1·5
New milk	2 ,,	273	22	5·32	3·0
Skimmed milk ...	¼ ,,	1,748	174	·82	·38
Skimmed milk ...	½ ,,	873	87	1·64	·76
Skimmed milk ...	1 ,,	437	44	3·28	1·52
Butter milk ...	⅙ ,,	2,514	262	·576	·25
Butter milk ...	½ ,,	838	88	1·15	·75
Whey	...	...	...	...	...
Skimmed milk cheese	3 ,,	782	122	1·98	·54
New milk cheese ...	8 ,,	333	40	4·33	1·65
Tea	3 per oz.	...	3·3	...	20·0

I have only now to offer an apology for the length of this communication, and to state that with the information obtained I shall be prepared to consider the combinations of foods in private and public dietaries, should an opportunity be offered to me.

DISCUSSION.

Dr. LANKESTER (responding to the invitation of the chairman) said they must all feel the importance of this subject, and they were much indebted to Dr. Edward Smith for bringing it before the Society. At the same time he felt that the great food question could not be decided merely by a few experiments. This was a subject to be treated with the greatest caution, and all that had been done hitherto, only served to indicate the direction in which further inquiry must go. Our Government had been lately paying attention to this question, especially by means of that Committee before which Dr. Edward Smith himself had given evidence, but he (Dr. Lankester) must say that, in certain practical departments, the Government had paid little or no attention to this matter. He formerly held the office of Superintendent of the Food Museum at South Kensington, but he felt bound to say no encouragement was given him or the other officers of that department in the proper development of it. Enormous sums had been expended in the purchase of works of art which, in his opinion, were of little value as compared with the more important matter of the food of the people: and every effort appeared to be made to suppress the development of that department of the museum. Dr. Edward Smith had rather disparaged the experiments of

Liebig and his school, but he (Dr. Lankester) must say they were deeply indebted to that great chemist for the light he had thrown upon the subject of chemical physiology; and though Dr. Smith was inclined to disregard the distinction drawn by Liebig between heat-givers and flesh-formers, yet he (Dr. Lankester) thought there was no better mode of describing those articles of food which supplied carbon and those which supplied nitrogen. Dr. Smith appeared to have ignored hydrogen, which was a powerful heat-giving agent as well as carbon; consequently, when the hydrogen derived from such food as fat and butter was disregarded, a false view of the value of those articles of diet was arrived at. The fact was Liebig was quite correct when he stated that the value of butter and fats in relation to sugar and starch as heat-givers was as $2\frac{1}{2}$ to 1. Our knowledge of the action of various foods was one to which further contributions were constantly being made. With regard to the influence of alcohol, a subject treated by Dr. Smith before this Society two years ago, the experiments of M. Baudot had materially modified the conclusions arrived at by Messrs. Lallemand and Perrin, and this showed how carefully this subject of food should be approached. He had been at some pains to consider some of the practical questions with which Dr. Smith had more particularly dealt. With regard to the question of brown bread, he could say he had eaten it himself regularly for the last 20 years, with considerable advantage; at the same time, he was free to confess that upon its introduction into families there was a distaste manifested towards it by children, which he was at a loss to account for. With reference to the point urged by Dr. Smith, that brown bread was of an excrementitious character, he thought the experiments on which that conclusion had been arrived at were limited and vague. He (Dr. Lankester) thought that Dr. Smith had been led into error from having found in his microscopic examinations of excrement the cellulose of the bran, which was not capable of assimilation, or at least only so to a partial extent. The substances which were passed off when brown bread was eaten, were those which were not digestible, and which he (Dr. Lankester) had characterised, in his analyses at the South Kensington Museum, as substances accessory to food, and not really food, but which he allowed had been estimated by the school of Liebig as heat-givers, but which should properly be regarded as accessory or excrementitious matters. It seemed to be quite necessary along with the food to take a certain quantity of indigestible matter. He therefore thought Dr. Smith had not quite proved that throwing away the bran was not injurious to the community by whom it was practised. Then there was another element in the consideration of this question, namely,—that the value of foods was not to be estimated solely by the amount of carbon and nitrogen which they contained, but their mineral elements must be taken into consideration. Many of the substances mentioned contained mineral constituents, but Dr. Smith had not alluded to these. The potatoe might be an expensive thing with regard to carbon and nitrogen, but it might turn out to be a cheap thing with regard to its mineral constituents. Words could hardly exaggerate the importance of that vegetable as a food. They found as it increased in price so disease increased. It was an article of so much importance, that the Registrar-General published the prices of it, and in proportion as these rose, marriages and births decreased and deaths increased. What did that depend upon? Not on the carbon and nitrogen, but probably on the mineral elements. Milk and cheese respectively contained these mineral constituents in a large degree. The latter was not only valuable on account of the caseine and butter it contained, but also on account of its mineral constituents, and he thought Dr. Smith should not have left them out of consideration. The relative digestibility of the various kinds of food was also most important. He had shown that split peas and maize bread were the most perfect kinds of food they could use, considered in the relation of their chemical constituents to their price. Why then should anything else be eaten? Simply because the nitrogen so essential to the body was not taken so readily from bread as from meat, so it was better to pay twice the amount for it in the form of fresh meat than in bread: it was the ready appropriation of animal food which made it so important as compared with the various forms of vegetable food. If they fed soldiers and sailors, paupers and prisoners, on such principles as Dr. Smith had advocated, they would feed them to their injury. They could, however, hardly have fed soldiers worse than they did up to the last few years. It was indeed folly to feed men with boiled beef, throwing away the water in which it was boiled and giving merely the fibrous matter of the meat, from which all the nutritious juices had been extracted. He should be glad to see the time when men like Dr. Smith, Mr. Lawes, Dr. Gilbert, and others, who had worked with so much earnestness and care on this subject, were consulted by the Government, and a proper dietary laid down for our public establishments.

Dr. Gilbert thought all recent investigation tended to show that the relative values of different food-stuffs could not be so directly estimated by their proportions of nitrogenous or so-called flesh-forming substances as had been generally supposed. It was maintained that bread containing the bran of the wheat was better food for the labouring classes than white bread, because it contained more nitrogen. He quite agreed with Dr. Smith, however, that whole-meal bread was the rich man's, not the poor man's food. It would hardly be doubted that the man who was rather under than over fed would improve his white-bread diet much more by the addition of fat bacon than by the retention of the bran in the flour. Yet, by the use of the bacon, the labouring man diminished considerably the proportion of the nitrogenous to the non-nitrogenous constituents in his food. Even the classes who used the leaner meats undoubtedly reduced the proportion of the so-called flesh-forming to the so-called heat-producing constituents, by the admixture of animal with vegetable diet, owing to the large quantity, and high equivalent of the fat which the former introduces into their diet. It was probable, however, that those who are well-fed on a mixed animal and vegetable diet, do take a larger actual quantity of nitrogen into the system than those exclusively fed on vegetable food. A certain quantity and proportion of nitrogen were of course essential, but as our current food-stuffs go, the under fed seemed generally first to feel the want of more of the non-nitrogenous matters. In settling dietaries on chemical principles, he (Dr. Gilbert) thought it important to take into the calculation what was called the free hydrogen; a point which he illustrated by reference to figures, showing that in the case of the animal aliments, it made a considerable difference whether the free hydrogen were estimated or not. Independently of ultimate composition, digestibility and assimilability were, of course, important points to consider; and here came in observation and experience to modify the conclusions deduced from purely chemical data. It had been remarked that hence error arose, in not eliminating the cellulose in estimating the nutritive values of foods. Undoubtedly a large quantity of cellulose passed from the body undigested; but recent investigations of Mr. Lawes, himself, and others, had shown that ruminant animals digested a good deal of the cellulose they took into their stomachs. There were not, as far as he was aware, any facts showing whether or not the human economy appropriated any considerable quantity of cellulose. It might, however, safely be concluded that the indurated cellulose of bran would be little, if at all, amenable to the digestive process, and there was no doubt that the branny particles did keep up an active condition of the bowels, and tended to aid the passage from the system of undigested or unassimilated, but digestible or assimilable material.

Dr. Wyld remarked that Dr. Lankester had made an eloquent appeal on behalf of bran, but at the same time he (Dr. Wyld) declared himself a convert to Dr. Smith's view on that subject. The various national predilections for certain descriptions of food were remarkable. On the part of the Scotch there was a national preference for oatmeal, an article of food which was adapted to the peculiarities of the climate. The almost universal dislike of children to brown bread he attributed to an instinctive desire for that food which most promoted the physical development of the body and which contained the smallest amount of *débris.* When the Government attempted to force brown bread upon criminals it occasioned insurrection amongst them, which seemed to show that they instinctively knew better than Government what was good for them. There was one view of the subject which had not been touched upon. Chemists had written learned works upon the necessity of taking food containing a certain proportion of nitrogen, but at the same time they laid no stress upon the nitrogen contained in the atmosphere; they laid stress upon the oxygen and ignored the nitrogen. Science had not been able to prove that the animal system absorbed nitrogen from the atmosphere, but he had no doubt this would be manifested by the further progress of science. It was a common observation amongst dentists and medical men that the teeth of the rising generation were bad, and decayed very rapidly, and in this respect he might perhaps say a word in favour of bran. The Scotch who fed on oatmeal had, as a rule, larger, stronger, and better teeth than were found amongst the pork and white-bread eating peasantry of this country. It was the prevailing opinion of medical men of the present day, that children required a considerable proportion of animal food, and he thought that as a rule they had too much, and that the decay of the teeth was in a great measure attributable to that cause. He had been struck with the fact that so few varieties of bread-food were employed; the only ones were white and brown bread. He saw no reason why they should not have tempting varieties of bread made by the combination of oatmeal, ryemeal, barleymeal, potatoes, &c. By the introduction of such admixtures, they might be enabled to employ a smaller amount of animal food, especially in the case of children. Dr. Wyld proceeded to express an opinion unfavourable to pork as an article of food, and remarked that it was prohibited as unclean by Moses, whose hygienic regulations had never been surpassed. One remarkable result incidental to eating raw pork, which was often in a diseased state, was the production of the tape worm in the human stomach. He also condemned all young meats, such as veal and lamb, as objectionable articles of food. He advocated animal food in the form of sausages as a nutritious form of diet, particularly for the labouring classses, the skin in which it was enclosed retaining all the essential juices. He differed from the remarks of Dr. Smith with regard to cheese, and was of opinion that the best was in the end the cheapest to the working classes. The most nutritive cheese was that which was made in Switzerland, though its high price in this country precluded its use by the poor. He submitted that the practical experience of mankind was the best criterion of the value of the different descriptions of food.

Dr. Robert Dickson, responding to the call of the chairman, said he had paid a great deal of attention to this subject, both theoretically and practically, and he was happy to say he had learnt a great deal from the paper read this evening. Of the relative value of white and brown bread opinions would differ, which was in a great degree owing to the diversity of tastes among mankind, which prevented an undue "run" upon any particular article of food. If the object was to afford nutriment to the system, he believed brown bread was inferior to white; if the object was to obviate a tendency to constipation, induced by a too sedentary habit, its use was essential. Dr. Lankester had very properly remarked that too little value had been attached to hydrogen in articles of food—whether animal or vegetable. There could be no doubt of the great utility of hydrogen as well as oxygen, to which scarcely any attention had been given in the paper. The hydrogen which existed in vegetable matters in the form of various hydro-carbons was of immense value. There were also other constituents in food of great importance. Nothing had been said of the great value of phosphorus, yet they all knew how essential that was to the animal system. It was alike important in health and in disease, and was an essential element to be taken into consideration in estimating the relative values of foods. Hence fish, which contained phosphorus, was a most excellent article of food, and if it were cheaper no doubt it would be more largely used by the lower classes. This was a question which required careful handling, for at present we were only upon the threshold of the subject, and he looked to science ultimately doing great things for mankind in this direction. In the meantime they were greatly indebted to Dr. Smith and others like him, who had acted as the pioneers in this important enquiry.

Mr. Frank Buckland, being called upon by the chairman, said having had the medical charge of a regiment of the Guards for some years, he had made it part of his duty to observe the effect of diet upon those fine specimens of Englishmen. He found young recruits from Ireland who had lived chiefly on potatoes all their lives, and were apparently strong, muscular men, after being put upon the ordinary diet of the English regiments, altered very much in appearance, and though they made flesh very considerably, they frequently broke down physically in going through their duties. The biggest boned men in the regiment were north country men and Scotchmen. That might be attributed to the oatmeal and also to the coldness of the climate. People from cold countries were invariably strong. Dr. Lankester had remarked upon the bad feeding of the army in former times. A great deal of the evil arose from the want of proper cooking of the food. A man was told off from the regiment to act as cook to his comrades, who probably had no previous knowledge of cookery; but now a school of cookery had been instituted at Aldershot for the instruction of men in those duties; and he could inform Dr. Lankester that the water in which the meat was boiled was not now thrown away. The ordinary rations of a soldier were ¾lb of beef or mutton, 1lb of bread, 1lb of potatoes, with coffee and tea for breakfast and supper. The young recruit could not do his work upon that, and his extra requirements had to be provided out of his own pocket; but an old soldier, who was near the time of his discharge, throve very well upon those rations, and a man promoted to a corporal, who was exempted from hard duty, soon began to lay on fat, which proved that the dietary he had mentioned was suitable for the average of soldiers. There was a form of indigestion which the labouring classes called the water-brash, and he was informed that that complaint was curable in the majority of cases by simply leaving off drinking tea. Boiled meat sometimes had a tendency to produce this disease, and he would recommend those who gave away meat in charity, to have it previously roasted, by which plan the recipients were more benefited than when they were left to cook it in their own imperfect and often wasteful way.

The Chairman said they would all agree that the inquiry which had been instituted by the Privy Council was of the highest public as well as private importance, and, so far as it had been carried out, it appeared to him to have been very ably executed. Hitherto Dr. Edward Smith had been confined in his researches to the dietaries in use amongst the poor of the northern districts of England, of Scotland, and of some parts of Ireland. The observations he had made there were highly valuable. They indicated the superior efficacy of the simpler diets, those of oatmeal porridge and milk in Scotland, and of potatoes

and bntter-milk in Ireland. He had ascertained that in Scotland the country bred people, when they went into towns and obtained higher wages, and substituted tea and bread and butter for oatmeal porridge and milk, did not thrive so well upon this more expensive and stimulating diet. Public warning should be given of these results. It was highly important that these observations should be extended to the examination of the effects of the large variety of high and low dietaries in use in public institutions. There was great advantage in the observation of the effects produced on persons of similar ages and conditions, who might be weighed and examined. A German prince had lent to Liebig a body of soldiers to make experiments upon. He (the chairman) had promoted trials of different sorts of dietaries in prisons, and those trials might well be repeated under such scientific observations as Dr. Edward Smith was pre-eminently qualified to make. If the examination of the effects of the brown bread, as compared with the white wheaten bread, made by Dr. Edward Smith, were deemed conclusive, let the trials be repeated on other classes of persons. Each chief article of food ought to be separately tried. The late Mr. Aubin, the manager of the Central District School of London, who had had 30,000 children under his care, and was a good observer of foods, had found that there were great variations in the effects of various conditions of the same food; for example, oatmeal of inferior growth or condition produced eruptions on the skin and functional disturbance, whilst a good quality of growth was productive of good effects. It had fallen to him (the Chairman) to collect and compare, rudely as it might be, the effects of different public dietaries before chemical analysis had been brought to bear on foods. The dietaries collected from different parts of England, he found, when reduced to comparative weights, fell in the following scale, that was, the aggregate amount of solid food. The average that each class got was as follows:—

As agricultural labourers	122
As artizans of the highest wages	140
As paupers	150
As soldiers	168
As prisoners in goal	217
As convicts on board the hulks, or, as transported felons	237

To an allowance of ten pounds of meat a week in the stimulating climate of Australia, was added half-an-ounce of tobacco daily for the use of the convicts in Western Australia. It was at that time urged by medical authorities, and indeed was so still by many, that dietaries containing high stimuli beyond those got by the hard working honest population were necessary to sustain the health of the prisoners. He found that the quality of the diets, as containing more or less of animal food, was very much represented by the cost, and this varied from 1s. 2d. to 5s. and even 7s. per head per week. Now, it should follow, from the medical recommendations, that the health of the prisoners would rise in proportion. To determine this question he resorted to statistics. Taking 104 prison returns—which enabled a comparison of the twenty gaols where the expense and the quantity of the diet were the lowest; the twenty where the expense and the quantity of the diet were the highest, and the twenty where they were intermediate between the highest and the lowest—the results came out as follows:—

	Ounces of solid food week.	Cost per head per week.	Sick per cent.	Deaths per 1,000.
Twenty Lowest Prison Diets	188	1s. 10½d.	3	1½
Twenty Intermediate Diets	213	2s. 4½d.	18	3
Twenty Highest	228	3s. 2d.	23½	4

The results were objected to on the grounds that in some of the larger prisons, where the lower dietaries were adopted, the terms of imprisonment were shorter than in others. But those objections were met by the trial of the simpler dietaries in the same prisons, with the same classes of prisoners, with labour and without labour, for the like periods, where the like results appeared. No doubt changes of diet were beneficial, if not absolutely necessary, for persons in sedentary conditions or prolonged confinements, but variations with simple foods might be made to suffice, instead of augmentations in quantities, and in foods of the more stimulating and expensive character, beyond those which sufficed for the general population. Later experience was in the same direction. But sanitary conditions had yet to be taken into account in judging of the effects of dietaries. In one instance a severe epidemic broke out in an establishment for pauper children, which was proved to have been produced, not by insufficient diet, but by defective ventilation. In the case of the army, insufficient diets were assigned as the main or the sole cause of the mortality in the Crimea. The diets were augmented, and fever and epidemics were still rife; but when the air was purified by sanitary measures the health improved. The death rates in the army had been reduced in many instances by sanitary measures by one-half, without any important alteration of the dietaries. The effects of the prison dietaries, combined with improved sanitary conditions, were the most instructive. Soldiers were taken from the ranks, generally the worst conditioned men, where the death rate was seventeen in a thousand, and put into military prisons in Ireland, where the death rate was reduced to two and a-half per thousand, and the sickness in proportion. The dietary consisted of 8 ounces of oatmeal, 8 ounces of Indian meal, and 8 ounces of wheaten bread, with half a pint of milk at the three meals daily. There was no meat, no tea, no coffee, no beer, no tobacco, none of the stimuli which they got in the ranks, and their general health and strength was vastly improved. The medical authority who had observed the effect of the dietary for years declared he would make no alteration. But he (the Chairman) attributed a considerable proportion of the superior effects to the sanitary condition of personal cleanliness in addition to the element of improved ventilation. The Chairman mentioned a case of a general in Spain who had improved the health of his men by giving a bath daily, though their rations at the time were low. He urged the importance of personal cleanliness in the army. The importance of this had even been proved in the case of pigs. All evidence established the conclusion that, daily complete personal ablution would be productive of a large economy of food to the poorest of the population. In respect to the quantities of foods, he was of opinion that inasmuch as there were wide variations of natural appetite amongst men, there ought, as a general rule in public dietaries, to be one simple article of food allowed without any stint. The meeting would, he was sure, give a unanimous vote of thanks to Dr. Edward Smith for his able paper on this nationally most important subject.

The vote of thanks having been passed,

Dr. EDWARD SMITH, in acknowledging the compliment, said he thought that some of the remarks of Dr. Lankester had been made without due deliberation. He had characterised the experiments he (Dr. Smith) had made as limited and vague. He could say, having been appointed upon the committee of the British Association, that the experiments were made continuously for a month upon four persons in Coldbath Fields Prison, and likewise upon the same number of persons in Wakefield Gaol, the examination of what passed from the body being chemical, and not merely microscopical, as Dr. Lankester had assumed. He therefore thought those experiments were not open to the objection that they were either limited or vague. With regard to the constituent of hydrogen in food, he had not undervalued this element, but had said that if he were treating of the nutritive value of food in a chemical aspect only, apart from any daily measure of the amount required by the body, he should add the free hydrogen also, since by its combination to form water within the body it must gene-

rate heat; but we had no means of ascertaining how much heat is produced and required by the body; neither could we ascertain how much of the water which leaves the body is generated in this manner, and how much is due to that which was taken as food. No doubt the mineral matters contained in the food were of the highest importance, and in mixed diets these were found. With reference to the remarks of Mr. Frank Buckland, as to the physical condition of the Irish recruits, he would say he was now engaged in a large inquiry, on behalf of the Government, to ascertain the exact amount of food taken by the different classes of the community in England, Ireland, and Scotland. At present he could not give the results of that inquiry, but in due time they would be published. The important question as regarded the Irish recruits was—not the potatoes, but the milk. The amount of milk taken by that class was generally large, and the great advantage to the muscular system was derived from this source, and not from the potatoes.

The Secretary announced that the next ordinary meeting would be held on the 20th January, 1864.

Proceedings of Institutions.

Greenwich Useful Knowledge Society.—A lecture was delivered here on the 8th Dec., by Dr. Yeats, of the Upper and Middle Schools, Peckham, on the subject of "Enterprise." It included a brief sketch of several living inventors, and a recommendation to all to peruse the list of premiums lately published by the Society of Arts. A vote of thanks to the lecturer terminated the proceedings.

Leeds Church Institute.—On the 26th Nov. the annual *soirée* was held in the Victoria Hall, which was crowded. Lord R. Cecil, M.P., presided, and was supported by the Vicar; Mr. Powell, M.P.; Mr. Collins, M.P.; Mr. Edward Akroyd, &c. The Chairman delivered an address on the "Benefits of Education," in the course of which he said there had been a great deal of unreasonable expectation on the part of the friends of education; they had expected that education would do things which nothing could do—that it would eradicate the tendencies to crime from the human heart. It was needless to say that their expectations had been disappointed. Crime had been as rife, perhaps more rife, in the present day than at the time when the educational movement commenced. That was not the benefit we had any right to look for. We had no right to expect that people would be less thieves or burglars than they were before. But that which we had a right to expect, and that in which our expectations had been justified, was, that the masses of the people, in moments of great trial, would show a truer appreciation of economical laws, and greater and more intelligent self-restraint. That they had done, and he maintained that the spectacle which this generation had witnessed amongst the operatives of Lancashire was the greatest proof of the success of education—of its value to the politician—its importance to the commonwealth—and its efficiency in rendering men better citizens and better men. In speaking of the prevalence of sensual pleasures amongst working men, he said the remedy was to provide people with some other means of enjoying themselves. If people were to read, and enjoy what they read—not only to use their intellects, but to enjoy those intellects—an enormous counter influence to vicious and sensual enjoyments was created. The great object which, he believed, education would serve among the masses, was not in preparing them to be great men, but in furnishing them with the means of wholesome and innocent enjoyment, which would occupy their hours of recreation.—The Rev. Canon Atlay, president of the Institution, presented a statement of its position. In 1861, when there was what he described as an "alarming crisis," they had to announce a deficiency of £51, but in the succeeding year the entire debt was liquidated, and £30 placed to the credit of the special book fund. The affairs of the Institution then began to wear a brighter aspect. During the present year their receipts had been larger than in any previous year, and at the end of December they hoped to have a balance of about £23. The number of members had also increased from 380, in 1860, to 409 in 1861, 543 in 1862, and in the present year to 593. The weak point was the classes, but this, he believed, was common to nearly all similar institutions. Mr. Powell, M.P., Rev. Canon Trevor, Mr. Akroyd, Mr. Collins, M.P., and other gentlemen, addressed the meeting.

Fine Arts.

Stained Glass Exhibition, 1864, South Kensington Museum.—The Executive Committee for the proposed Exhibition of Stained Glass, to be held in May next, in a portion of the recently completed cloisters of the South Kensington Museum, consisting of Mr. T. Gambier Parry, Mr. R. Burchett, with Mr. G. Wallis as secretary, have reported to the Department of Science and Art that, after considering all the claims sent, they recommend that window spaces be allotted to the following producers of stained glass:—Messrs. T. Baillie and Co.; H. M. Barnett, Newcastle-on-Tyne; J. Bell, Bristol; Chance, Brothers, and Co., Birmingham; Cox and Son; Davis and Barraud; R. B. Edmundson and Son, Manchester; Field and Allan, Edinburgh; J. A. Forrest, Liverpool; C. Gibbs, jun.; J. Hardman and Co., Birmingham; Heaton, Butler, and Bayne; Holland and Son, Warwick; Moberley and Lyon; Morris, Marshall, Faulkner and Co.; M. and A. O'Connor; Pilkington, St. Helens; J. Powell and Sons; W. Wailes, Newcastle-on-Tyne; Ward and Hughes; J. P. Warrington; W. Warrington, sen. The Committee remark that the whole of the space available, the varied dimensions of which had been forwarded to each of the invited exhibitors, was claimed, except a large space capable of being enclosed to any given form, with 50 feet high by 22 feet wide. This presents an opportunity for the exhibition of a large window under circumstances which rarely occur, and it is greatly to be desired that some artist in glass, having a suitable work in the course of execution for a church or cathedral, should undertake to occupy it during the period of exhibition, which will last during the summer months of 1864.

Commerce.

The Cotton Supply Association has during the last five years expended nearly £5,000 annually in promoting the growth of cotton in all parts of the world; it has distributed upwards of 600 cwts. of cotton seed, nearly 700 cotton gins, a quantity of ploughs and other agricultural implements, together with horse and cattle gear, and driving wheels for working gins where steam power could not be obtained. It has awarded prizes for the best treatises on the management of the cotton plant, and improved methods of cotton agriculture. Medals have also been given to successful cultivators. Extensive influence has thus been gradually acquired in all cotton-growing countries, whilst valuable information and assistance have been rendered. Various agencies have been called into existence to co-operate with the association; and through its representations different governments have been induced to afford special facilities for the cultivation of cotton, by exempting lands devoted to its growth from all taxes for a period of five years or more, by a liberal distribution of seed, and by royal commissions to afford all necessary aid and encouragement.

Cotton.—The official values of the cotton imports from 1858 to 1862 were as follow:—1858, £30,106,000; 1859, £34,559,000; 1860, £35,756,000; 1861, £38,653,000; 1862, £31,093,000. For the first eight months of the present year they have been officially valued at £26,862,000, and for the last four months of the year they may be taken at £23,000,000; total, £49,862,000. But for 1864, if present rates be maintained, the value would be £86,656,000, or nearly three times that of the imports of 1858, which included the American crop. As the amount given for the ensuing year may appear extravagant, the mode of calculation is given:—

	Bales.	lb.	
India	1,650,000	of 360 at 21d...	£51,975,000
Egypt	300,000	of 550 at 26d...	17,531,000
America	140,000	of 440 at 26d...	6,673,000
Turkey and Greece	140,000	of 300 at 23d...	4,025,000
Brazil	190,000	of 190 at 26d...	3,911,000
China	200,000	of 200 at 20d...	3,334,000
Italy, &c	15,000	of 440 at 23d ..	632,000
Other sources	30,000	of 200 at 23d...	575,000
			£88,656,000

It is true that a portion of this amount will be refunded from re-export, but in the meantime the capital to carry this large trade has to be found in this country, and the evil is exaggerated by the proportionately large capital involved in the manufacture and export of cotton goods to distant countries. In the provinces of Corrientes, Entre Rios, and Santa Fe, millions and millions of cotton plants are at present over the earth, with every prospect of doing well. Paraguay has also set a noble example in this new industry. With a good season, 5,000 bales of clean cotton will be exported this season from the River Plate. Such is the encouragement given in some instances that the provincial governor has not only relieved cotton plantations from local taxation but has actually offered farms of land, in fee, gratis to all who applied them to cotton planting.

Obituary.

The death of the Earl of Elgin, which occurred in India on the 20th November, is recorded with deep regret. He was the eldest son of the Earl of Elgin, who brought over the well-known marbles now in the British Museum. He was born in 1811; in 1841 he was elected M.P. for Southampton; in 1842 he went out as Governor of Jamaica, where he remained four years; he was then appointed Governor of Canada; in 1846 he married a daughter of the Earl of Durham; in 1857 he was sent as Ambassador to China; on his return he was appointed Postmaster-General, but again went to China in 1860, the French Ambassador, Baron Gros, accompanying him in his mission. He returned early in 1861, and was soon after appointed Governor-General of India, where he remained till his death. He presided at the 107th annual dinner of the Society of Arts, in 1861.

James Duffield Harding, the well-known water-colour painter, died on the 4th of December, at Barnes. He was born in 1798. His father, who was also an artist, was a pupil of Paul Sandby, and his own taste was principally matured by Samuel Prout. He was also a careful student of Turner's "Liber Studiorum." In early life he became a pupil of an engraver. In 1818, he received the silver medal of the Society of Arts for "an original landscape." He became a teacher of drawing, and in 1830 visited Italy, where he made sketches on coloured paper, which led to the extensive use of that material. In 1836 he published "Sketches at Home and Abroad;" and in 1842, "The Park and the Forest." In 1861, his "Selections from the Picturesque" appeared; he having also published, at various times, "Lessons on Art," "Guide and Companion to 'Lessons on Art,'" "The Principles and Practice of Art," and other works, and having also illustrated several annuals. He was one of the principal members of the Old Society of Painters in Water Colours, but having some years ago taken to oil painting, he desired admission to the Royal Academy, and in obedience to the rule which forbids a candidate from being a member of any other society, he left the Old Water Colour Society. He was, however, not admitted into the Academy, and after some time he joined his old Society. He was elected a member of the Society of Arts in 1847.

Notes.

Rifle Conference.—A conference will be held on Tuesday, Wednesday, and Thursday, January 12, 13, and 14, 1864, in the Halls of King's College, London, the object being to enable those who are interested in rifle shooting to consider the management of rifle matches, prize meetings, and other competitions; to impart information as to the apparatus and weapons employed; the targets, marking, and scoring; and the various adjuncts of rifle shooting, as well as to discuss the arrangements and regulations which have been approved by experience, or are suggested as further improvements. A committee of experienced shots has been formed, the chairman being Captain MacGregor, of the London Scottish; the vice chairman, Captain Woods, of the Central London Rifle Rangers; and the hon. secretary, Lieut. Cunningham, of the 18th Middlesex (Harrow). The committee will endeavour to embody the information obtained and to sum up the results, in a published report, which will be submitted to the National Rifle Association, with a view to aid that body in its efforts to make rifle practice more popular and more effective. A room will be provided for exhibiting such models, machinery, drawings, plans, and instruments, as may require to be explained.

Exhibition Building.—An absurd statement has been going the round of the daily papers to the effect that the recent gales have blown all the glass out of the domes. The glass was removed from the domes very soon after the Parliamentary decision against the purchase of the building, and the recent gales caused no damage of any kind to it. It is expected that the scaffolding in the eastern dome will be sufficiently advanced to commence the removal of the gilded spire in the course of three weeks.

Correspondence.

Electric Regulators.—Sir,—Mr. Ladd's remarks call for reply. No one has questioned the excellence of Mr. Holmes's very beautiful electric regulator. *The* question raised (and one not to be blinked by any amount of self-assertion) was—Could not a simpler form of lamp be designed, that would be less liable to injury in the hands of rough lighthousemen? I therefore called attention to two forms of electric regulators that meet this demand, viz., Professor Way's and Dr. Squire's, and I venture to assert that the latter gentleman is thoroughly conversant with the construction and practical manipulation of the various known arrangements, having made automatic electric lamps a hobby; and he has invented more ingenious modifications and simplifications in this direction than any one I am acquainted with, but, having no monetary interest at stake, he has taken no pains to bring his inventions before the scientific public. If the battle of the electric lights at the Polytechnic was not *professedly* "a competitive trial" it was so virtually—but it was a drawn fight, for no difference could be observed in the performance of those brought into action, and Dr. Squire's burnt as steadily as any of the others during the time the batteries were in working order, but towards the end of the evening I had to give up my terminals for "the sub-

marine light," exhibited in the tank below. On again making connection I found a falling off in the battery supply. I leave it to your readers to determine whether Mr. Ladd's criticism is a fair one, for an experienced and unprejudiced eye ought to have discerned that the kind of unsteadiness he alluded to was not attributable to a defect in the mechanical part of the arrangement. Any way, I have sufficient confidence in Dr. Squire's regulator to offer to place it for trial, in the hands of any competent person, untrammelled by trade interest.—Samuel Highley.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...R. Asiatic, 3.
Ethnological, 8. 1. Mr. Francis Galton, "On the First Steps towards the Domestication of Animals." 2. Rev. G. Rome Hall, "On the British God Mogon and the Religion of the Northumbrian Celts."
Sat. ...Royal Inst., 3. Prof. Tyndall, F.R.S., "On Electricity at Rest and Electricity in Motion." (*Juvenile Lectures.*)

Patents.

From Commissioners of Patents Journal, December 11th.

Grants of Provisional Protection.

Animal and vegetable substances, preserving—2951—D. W. Rea.
Bags, travelling—3004—J. E. and E. H. Blundon.
Balloons—2959—W. E. Newton.
Beetroot, manufacture of paper, etc. from—2967—L. Accarain.
Blond, joined—2960—J. Sibert.
Bolts, nuts, etc., machinery for making—2936—F. Watkins.
Boring rock, etc.—3000—E. W. James.
Braiding machines—2957—R. Furnival.
Braiding machines—2942—W. Bestwick.
Brick-making—2944—P. Bawden.
Brick making machinery—2932—W. Williams.
Cab indicators—2989—P. Gaskell.
Carriages—2907—E. Christmas.
Carriages and wheels—2994—A. Etienne.
Casks, stopping holes in—2905—J. Collyer.
Chaff-cutting machinery—2993—T. Lane.
Coal, washing small, etc.—2901—I. Francis.
Colouring matters—2739—R. Smith.
Cottages—2867—E. W. Elmslie.
Cotton gins—2915—B. Dodson, E. Barlow, and P. Knowles.
Cotton machinery—2906—R. Walker, J. Walker, and B. Brown.
Cotton, mills for cleaning—2857—J. Harrison.
Cotton, rollers used in spinning, etc.—2914—E. Marwood.
Door knobs—2862—J. Hulse and J. Lawrence.
Door springs, etc.—2996—G. A. Thompson, sen. and jun., and J. Latham.
Electric telegraphs—3006—H. Wilde.
Envelope making—3027—A. W. Haley, A. Bingham, and R. Webster.
Extracting essences and perfumes, etc., also bleaching and purifying oils and fats—2987—H. Hirzel.
Fan blowers—2924—W. E. Newton.
Fibre-cleaning machinery—2958—W. E. Newton
Fire escapes—2965—M. Power.
Fire-proof floor or roof—2929—T. Turner.
Fitting together articles—2992—E. Ironmonger.
Floors of bridges, houses, etc.—2935—E. Finch.
Fuzes and shells for ordnance—3005—E. M. Boxer.
Gas generating, when made by passing air over volatile oils, and improving its heating and illuminating qualities—3023—W. Wilson.
Gas meters—3017—G. Glover.
Gas meters—2912—G. Rait and J. Winsborrow.
Gas, purifying, etc.—2971—R. Laming.
Gun-boats, etc.—2922—A. McLaine.
Guns, mounting, etc.—3016—E. A. Inglefield.
Guns and projectiles—2999—J. Chalmers.
Hydro-carbons, furnaces for the manufacture of—2981—F. Page.
India rubber, cutting strips of, etc.—2985—J. Clark.
Ink regulator—3021—G. Macfarlane.
Insects, destroying—2988—S. and T. Smith.
Intermixing dry, semi-fluid, or aqueous materials, etc., machinery for—2947—T. Carr.
Iron ores, treatment of—2903—J. Kirkham.
Letter and music clips—2928—C. E. Wright.
Lighting and heating—3015—W. Clark.
Lighting and ventilating—3033—J. Cutler.
Looms—2969—H. B. Barlow.
Looms for elastic fabrics—2984—J. Clark.
Looms for elastic fabrics—2986—E. Gardner.
Malt, mashing—2939—D. W. Hamper.
Marine fog signals—2962—C. L. Daboll.
Marking patterns upon skirts, for sewing and embroidering—2972—J. Thorpe.
Meat, etc., preservation of—2949—G. W. Yapp.
Metallic drums, kegs, etc.—2933—D. Cope.
Metals, presses for cutting—2964—T. Wilson.
Mining machinery—2786—R. H. Philipson and J. Dees.
Mules for spinning—3019—T. Mallinson.
Oil cans, etc.—2911—W. B. Hodson.
Oils, expressing—3018—J. Thom.
Paper pulp—2931—F. Fenton.
Paper spool tubes—2983—C. Crabtree.
Paraffine, etc.—2963—G. Parkin.
Photography—2954—G. Davies.
Pianofortes, hammers for—2918—A. H. Ferry.
Presses—2946—E. B. Wilson and J. Imray.
Pressing and ironing garments—2961—P. Tait.
Printing floor cloths, carpets, etc.—2952—W. Howlett.
Plough—3011—W. E. Gedge.
Rags, discharging colour from, etc.—2980—T. Gray.
Railway car springs—3007—P. G. Gardiner.
Railway carriages—2920—G. S. Kirkman.
Railways—2908—W. Symons.
Raising and forcing fluids—2975—J. Nadal.
Reefing and furling sails—2910—J. Colling and D. G. Pinkney.
Rotatory engines—2956—J. H. Johnson.
Scaling ladders, etc.—2923—G. Fawcus.
Sewing machines—2982—J. and D. Bateman.
Sewing machines—3020—S. B. Cochran.
Sewing machines, driving—2955—J. Lewis.
Sheeting piles, wrought iron—2909—R. Gooch.
Ships and other lift pumps—2968—J. H. Wilson.
Ships, coating bottoms of—2974—J. Baker.
Ships, coating the bottoms of—2945—J. Smith.
Ships, coating, telegraph cables, etc.—3012—J. G. Redman and G. Martin.
Ships of war—2995—A. Albini.
Ships, sheathing iron—3014—R. Turnbull.
Shirt collar—2976—J. S. Jarvis.
Sluice cocks and their connections—3003—C. Pontifex.
Steam boilers—2846—E. Hargraves.
Steam boilers, incrustation in—2913—J. Seward and H. Smith.
Steam engines—2927—J. H. Johnson.
Steam engines—2898—J. Elder.
Steering apparatus—3013—H. Lumley.
Stoves, hot-air—2919—J. J. Hays.
Straining wire for fences—3031—J. Harper.
Straw, thrashing and reeding—2921—T. Brinsmead.
Sugar refining—3010—G. J. Doddrell.
Sulphur from alkali waste, separating—3909—B. Jones.
Tapes, arranging etc.—2940—M. B. Westhead.
Testing the strength of materials—2970—D. Kircaldy.
Time register, self-acting—2997—W. Campion and G. and A. Wilson.
Umbrellas, frames for, etc.—2977—J. Chesterman.
Vermin traps—3008—R. Brailsford.
Watches, independent centre seconds—2990—E. Bevan and W. S. Weare.
Water, obtaining fresh, from sea water—3002—J. M. Ollis.
Water-closet traps, etc.—2973—J. Simmonds.
Water-closets and urinals—2991—C. Cordon.
Winding yarns—2979—W. C. Brocklehurst, and J. and J. Creighton.
Windlasses—2904—E. Walker.

Invention with Complete Specification Filed.

Fret saws—3059—H. A. Bonneville.

Patents Sealed.

1348. E. Ironmonger.

From Commissioners of Patents Journal, December 15th.

Patents Sealed.

1462. J. Johnson and W. Braithwaite.
1482. R. Blackburn.
1498. R. W. Gordon.
1505. J. Lightfoot.
1506. J. G. Jennings and M. L. J. Lavater.
1508. J. Steele and W. Mason.
1510. W. Neill, jun.
1511. J. C. Onions.
1512. R. A. Brooman.
1519. F. de Wylde.
1527. D. Barker.
1537. A. Morel.
1538. A. Morel.
1569. W. Clark.
1582. W. L. and T. Winans.
1584. W. L. and T. Winans.
1585. E. Brooks.
1596. A. E. Brae.
1612. J. Griffiths.
2388. H. Haigh and R. Heaton.

Patents on which the Stamp Duty of £50 has been Paid.

3004. B. G. George.
3008. G. Davies.
3027. R. Davison.
3038. J. Townsend and J. Walker.
3084. G. Davies.
3031. W. E. Newton.
3079. W. E. Newton.
3096. E. Barlow, J. Newhouse, and F. Hamilton.
3150. W. Clark.
3051. G. S. Harwood.
3057. J. Casson.
3129. G. Hadfield.
3054. A. Kyle.
3071. J. Chubb and E. Hunter.
3039. A. Verwey.

Patents on which the Stamp Duty of £100 has been Paid.

2950. J. T. and E. P. Wright.
2926. W. and T. Storey.
2940. W. Lund.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, DECEMBER 25, 1863. [No. 579. Vol. XII.

Announcements by the Council.

Art-Workmanship.

The works submitted in competition for the Prizes offered by the Society have been removed to the South Kensington Museum, where they will remain for the present.

Examinations.

Secretaries of Institutions and Local Educational Boards, are particularly requested to forward to the Secretary of the Society of Arts, as soon as possible, detailed lists of each Local Board as arranged for next year, specifying the chairman and secretary, and including the addresses of the members. In cases where the Board remains the same as last year, this should be notified without delay.

The Christmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

STATISTICS OF MODEL DWELLINGS.

The following is an abstract of papers lately laid before the Council of the Society of Arts, by Mr. T. Twining, in reference to the inquiry into the statistics of Model Dwellings and other analogous establishments, which he had been authorized to make with a view to prepare a secure basis for future undertakings of this kind, and thereby to induce large investments of capital in this direction.

By means of blank forms, showing in detail the nature of the information required, returns have been obtained concerning the following self-supporting establishments in the metropolis, accompanied in several instances with valuable remarks.

Labourer's Friend Society.

(Returns have been supplied by Ch. Payne, Esq., Secretary, 21, Exeter Hall.)

The Model Lodging-house in George-street, Bloomsbury, for 104 single men. Opened in 1847.

The Model Building in Streatham-street, Bloomsbury, for 54 families. Opened in 1850.

The Thanksgiving Buildings in Portpool-lane, Gray's Inn-lane, for 20 families and 128 single women, with a public washhouse. Opened in 1851.

The Hatton-garden Chambers, existing house adapted for 54 single men. Opened in 1849.

The Model Lodging-house, Charles-street, Drury-lane, ordinary London house (originally consisting of three tenements) adapted and improved as lodgings for 82 single men. Opened in 1847.

The improved dwellings in Wild-court, Drury-lane, 13 renovated houses, 106 rooms. Opened in 1855.

The improved dwellings, Clark's-buildings, Broad-street, St. Giles's, 11 renovated houses, accommodating about 80 families. Opened in 1856.

Tyndall's Buildings, Gray's-Inn-lane. Renovated houses accommodating 88 families and 40 single men. Also two houses, 26 and 27, Gray's-inn-lane. Opened 1857.

Metropolitan Association.

(Returns have been supplied by Charles Gatliffe, Esq., Secretary, 19, Coleman-street, E.C.)

The Model Building in St. Pancras-square, Old Pancras-road, for 110 families (420 rooms). Opened Dec., 1847.

The Metropolitan Buildings, Albert-street, Mile-end New-town, 60 families (234 rooms). Opened May, 1850.

The Ingestre Buildings, New-street, Golden-square, for 60 families (224 rooms). Opened in December, 1854.

The Model Dwellings, 21 and 22, Albion-buildings, Bartholomew-close, Aldersgate-st. Renovated houses for 20 families (40 rooms). Opened Jan., 1855.

The Model Building, Nelson-square, Nelson-street, Bermondsey, 108 families (408 rooms). Opened July, 1855.

The Albert Cottages, Albert-street, Mile-end New-town, for 33 families. Opened in August, 1858.

The Metropolitan Chambers, Albert-street, Mile-end New-town, for 234 single men. Opened Dec., 1849.

The Soho Chambers, 36, Old Compton-street, for 128 single men. Opened in March, 1851.

Marylebone Association.

(Returns have been supplied from the Office.)

The Christchurch Buildings, Little James-street, Lisson-grove, for 31 families. Opened in 1855.

The Stafford Buildings and Stafford Cottage, Stafford-street, for 19 families. Opened in 1858.

The Lisson Buildings and Cottages, Lisson-grove North, for 28 families. Opened in 1858.

The renovated dwellings, Nos. 16 and 35 to 38, Charles-street, Lisson-grove, for 25 families.

The Gray's Buildings, Duke-street, Manchester-square, renovated houses, accommodating 159 families, and gradually acquired from 1855.

(Returns for the following have been supplied by H. A. Darbishire, Esq., Architect and Honorary Secretary to the Trustees of the Peabody Fund, 4, Trafalgar-square.)

Columbia Square, Charles-street, Hackney-rd., Bethnal-green, for 183 families (390 rooms). Opened 1858.

Rochester Buildings, Duck lane, Old Pye-street, Westminster, for 168 families. Opened in May, 1862.

(Returns for the following have been obtained by personal inquiry.)

The Building near the Shadwell-station, for 112 families.

The Dwellings in Grosvenor-mews, Hanover-square, for 32 families.

The Albion Chambers, Dean-street, Soho, ordinary London house adapted for about 45 single men.

The Lodging House (now discontinued) at Camden-town, formerly belonging to Messrs. Pickford and Co.

The Dormitory, Dudley-street, St. Giles's, for 24 girls. Opened in 1858.

The Leicester-square Soup Kitchen and Refuge, Ham-yard, Great Windmill-street.

(Returns for the following have been supplied by Miss E. Twining.)

The Working Men's Coffee House, 46, Portugal-street, Lincoln's-inn.

(Returns for the following have been supplied from the Office.)

St. Marylebone Public Baths and Wash-houses, 181, Marylebone-road. Opened 18th of December, 1849.

In order that the important evidence which has been obtained may be speedily completed, and reduced into a shape which may render it a convenient means of guidance for future undertakings, a special committee has been appointed, consisting of the Hon. and Rev. Samuel Best, M.A., Mr. Samuel Gregson, M.P., Mr. Chandos Wren Hoskyns, and Mr. Thomas Twining, Members of Council, with Mr. H. M. Eyton, architect of the Model Dwellings erected at Hull by the Labourer's Friend Society, who has consented to act as honorary referee, and Mr. George Rigby, who has kindly undertaken the office of reporter.

The last-mentioned gentleman is now engaged in classifying and collating the information in hand, and in personally obtaining some desirable additions. Members who can undertake to supply returns of any model dwellings, or other buildings for the use of the working classes in the metropolis and suburbs, not included in the above enumeration, are requested to communicate with the secretary of the Society of Arts, who will forward blank forms and explanatory circulars. Equally acceptable would be any communications as to the merits, or demerits of any of the establishments above enumerated, derived from personal and impartial observation, or any general information or remarks suggested by the following memorandum:—

Subjects for Enquiry in reference to Model Dwellings and other Accommodation for the Working Classes in the Metropolis and Suburbs.

Financial Aspect.

Evidence of financial success or failure, and of the causes which may have chiefly contributed thereto, whether in the designs, the materials used, the more or less happy adaptation to the wants and notions of the class for whom the building is intended, the regulations and management, &c.

Presence or absence of desirable accessory advantages provided for the tenant by the landlord, *e.g.*, water supply, the use of a laundry and drying ground, of baths, of accommodation for household stores, of a hoist, &c.

Building contrivances, or special materials which have been found to diminish certain items of yearly expenditure, such as repairs, rates, insurance, &c.

Average return obtained for capital invested in the erection of dwellings of the old style, and of an inferior class in London.

Estimated amount of interest to be expected from capital invested on a large scale, in supplying the working classes of the metropolis with improved family dwellings, chambers, and other desirable accommodation. State what economic and sanitary conditions or regulations and management are contemplated in these estimates, as essential features.

Results obtainable from appropriating to shops the ground floor of model buildings in populous localities.

Sanitary and Social Aspect.

Remarks as to the sanitary features, and more or less cleanly and well regulated condition of urban and suburban model or renovated buildings.

Statistics of death and disease, as far as they can be fairly assumed to have been influenced by the condition of the establishments themselves, rather than by extraneous or fortuitous causes.

Expedients as to wall-surface, flooring, furniture, &c., which have been found conducive to a healthy condition of the dwellings.

Materials and contrivances which have been found efficient, convenient and cheap, for rendering a building fireproof, or for facilitating the escape of the inmates from the higher stories, *e.g.*, avoidance of timber work, external gallery system.

Authentic indications of moral and social improvement effected by dwellings reform.

Miscellaneous Considerations.

Advantages and drawbacks of the external gallery system.

Financial and economic results obtainable from combining in populous streets: 1. A row of shops on the ground floor. 2. Entresol apartments attached thereto. 3. A superstructure on the external gallery system, the galleries being, according to circumstances, at the front or back of the building. 4. Well-lighted and ventilated work-rooms, or bathing and laundry accommodation. 5. A terrace roof to serve as drying ground.

Co-operative stores, reading rooms, penny savings' banks, and other desirable accessories of large model establishments or *cités ouvrières*.

Comparison of the results respectively obtained by the erection of new buildings and by the adaptation of existing ones, as regards in the first case sanitary and economic advantages, and in the second case the facility and rapidity of the operation, the diminished outlay and the increased return.

What are at the present time the most urgent wants of the working classes in the metropolis, as regards family dwellings, furnished accommodation for families, lodging-houses for single men or for single females, dormitories for boys, &c.

Under what circumstances and in what localities may the *adaptation* of existing houses be adopted as a means for meeting these urgent wants.

What facilities, in the way of eligible sites, convenience of locomotion, or other advantages for the erection of *new* buildings for the working classes on a large scale, exist at present in the metropolis or suburbs, or are likely to arise in connection with the projected metropolitan improvements and railway extensions.

What financial combinations may most effectively and safely promote extended investments of capital for the benefit of the working classes, *e.g.*, limited liability companies, co-operative building societies, improved system of mortgage, &c.

Existing or proposed arrangements for so regulating the rentals, that after a certain number of years a working man may become proprietor of the cottage which he inhabits.*

Difficulties with regard to the collecting of rents, which have in several instances been an obstacle to the success of model buildings, and have led to the entrusting of their collection to a contracting agent.

Best means for enforcing punctual payments as a rule, without precluding leniency as an exception.

Comparison between the results obtained by quarterly and weekly tenancies.

Regulations and difficulties concerning the sub-letting of family dwellings.

* The following is an extract from a letter to Mr. Twining, from James Hole, Esq., dated Leeds, 11th May, 1863:—"We are not only making improved dwellings, but enabling working men to become the owners on very easy terms. By finding a fifth of the cost of the house, and paying the same rent he has been accustomed to pay for an inferior dwelling, a working man become his own landlord in 13 years."

Desirable additions to existing legislative enactments, *e.g.*, The Lodging House Act.

Legal enactments or parochial regulations calculated to favour the superseding of unsatisfactory by improved dwellings, *e.g.*, assessment of dwellings on the external gallery system as distinct houses. Assessment of the rates on the net instead of the gross rent in blocks of dwellings (each dwelling being under a certain rental) where the rates are paid by the landlord and not by the tenant; remissions for the first three years of certain rates on dwellings affording a given amount of accommodation under a given rental, and which shall have been satisfactorily reported on by the surveyor and medical officer of the district, or by other authorised inspectors.

Various expedients with regard to building designs and materials, management, private patronage, and government subventions, which have proved successful in other countries.

Very few returns have as yet been obtained from provincial towns and agricultural districts, but it is intended to direct special attention to this part of the inquiry, when that referring to the metropolis shall be more advanced. In the meantime any contributions of local information, or the addresses of persons to whom forms should be sent, would be very acceptable, as also reports of the progress of dwellings reform in other countries.

Proceedings of Institutions.

SOUTHERN COUNTIES ADULT EDUCATION SOCIETY.

The following paper, "On Giving an Artistic Turn to the Leisure Hours of the Labourer's Home," by W. Wallace Fyfe, Esq., of Charminster, Dorset, was read at the annual meeting of this Society, held at Devizes:—

A casual glance at Miss Jane Mill's lately published illustrations of "Kinder-Garten Educational Employment and Amusements,"* appears to suggest a cheap, an easy, and an interesting accession to those home and household attractions by which the cottage hearth may be made to rise superior to the enjoyments of the beer house. For although, as we all know, the German Kinder-Garten amusements are intended for very young children, it will be found, on looking more narrowly into the artistic tendencies of some or most of them, that there are two or more grounds on which it may be desirable to press them into the domestic training service, for use in the long winter evenings, and all other intervals between work and slumber that occur in the dull routine of the cottager's existence, which they may thus be made to vary. In the first place, they may well be recommended in order to engage the adults' attention, not only with a view to occupy and develop their ingenuity and taste (which they would do unconsciously), but primarily for the purpose of enabling them to instruct and entertain their children, with an ultimate tendency to stimulate the growth of similar taste and ingenuity in the children. In the second place, they may equally well be adopted as a means of culture and refinement amongst the rustic families, who, in proportion as their crudities are corrected in a manner interesting to themselves, will learn to love and recognise everything they now ignore that is graceful and elegant.

1. Our German neighbours are in all respects an example to us and to the world in their treatment of children. The German Christmas-tree, with its wondrous crop of family surprises, is perhaps the best illustration of the delightful feeling of domestic happiness which the attention bestowed by the adults on the little people is calculated to produce. The mode in which the pleasure of the smallest individual is made a special study, and the sense of no one being forgotten, generates self-respect, mutual kindness, and lays the foundations of personal character on an elevated basis. Much of this is wanting amongst the more boorish of our own rural population, and even the best and worthiest of our labourers and their wives think it much if they keep their children neat and clean, perhaps well-dressed, and give them a little schooling; such a thing as household culture is rarely thought of. The sort of pursuits which, on the model of the Kinder-Garten system of Frödel, might be made available for rendering every cottage hearth in England a magnet of interest and improvement for old and young, include, as we shall presently see, modelling—what is termed pea-work—paper-folding, cutting and plaiting, and finally drawing and writing; all of which in the elementary way in which they will immediately be presented, will be found eminently calculated for being carried out with facility. Now, to say nothing of the well-known laws of mental and physical relaxation which would be subserved by the introduction of these things, which Miss Mill tells us Madame Bertha Rouge has carried out to admiration in mere infant schools in this country, and which are, much more, therefore, capable of being developed in the family circle, there are principles of utility involved directly and indirectly in every attempt to give an artistic turn to the work of man's hands, the benefits of which we need hardly stay to demonstrate. It was noticed, at the unpacking of the goods for the first Exhibition of 1851, that the French artizan possessed an artistic training of such a nature that if a leaf or a fragment of ornament chanced to be broken or deranged, he could immediately remodel and probably replace it in plaster materials; whereas, I have actually seen an upholsterer's man, who had engaged to remove carved goods in safety, resort slyly to the expedient of knocking off a gold leaf or two on one side of a moulded frame, to correspond with the damage that had been accidentally done to the other.* By familiarising our common people in any degree with an artistic facility of handling fine or beautiful work, we shall gain many advantages. We shall, first of all, give them a taste for what is excellent in art, an appreciation of the beautiful, a desire to execute any task that may fall to their lot in a more tidy and elegant manner than would otherwise be dreamed of; and above all, if any latent talent may be lurking in the untutored genius of the obscure and low-born swain, we open up a chance of calling it forth, of exercising it, and putting it on the road to actual renown. That we are far behind all other civilised people in works of ordinary ingenuity and art, was known and felt so long back as the wars of the French Revolution; for we have in all those parts of the country where depôts for French prisoners existed, traditions of the pleasing and surprising ingenuity and taste displayed by those sufferers from the fortune of war, who found it necessary to resort to the exercise of the arts with which they were acquainted to raise a little money. Give a French prisoner a piece of bone, or other seemingly worthless material, and he would forthwith proceed to elaborate it into "a thing of beauty and a joy for ever;" and many of the prison depôts in this country were in those times perfect bazaars of fancy articles fabricated out of nothing by the ingenuity of the captive Gauls. Instances are not wanting amongst ourselves which show, however, that the same or similar capacities exist amongst the people could they be but stimulated into action. The crowds of visitors to the Channel Fleet, in its late aquatic ovation round our island shores, were more than a little astonished, for instance, to find Jack, in many instances, an adept at the tambour-frame, and accomplished in embroidery so as to be able to execute a banner-screen with any lady in the land. And no one can have forgotten the cork model of Lincoln Cathedral, which, in the Architectural Gallery of the late International Exhibition, attested so well the artistic ability of the self-taught workman by whom it

* London: Darton and Hodge, 58, Holborn-hill.

* Fact—It happened to myself.

was constructed, after many years of leisure labour, that since the close of the Exhibition he has raised a profit of £800 by exhibiting it, and has built himself two cottages of a more enduring kind with the proceeds, proudly inscribing them

"Perseverance, cork, and glue,
Eighteen hundred and sixty-two."

2. On the second head, I need say nothing more than that art is known as the great humaniser alike of high and humble life; before its acknowledged triumphs men hold their breath and gloat in admiration; the success of its humblest efforts gives joy and satisfaction to the heart, as if the proudest achievement of the human mind were the right direction of man's hands.

Now, then, let us consider what can be done in detail to realise some part of this programme of rural felicity? To begin with modelling:—

"The first occupation which we shall notice," says Miss Mill, "is modelling; and as we endeavour to make the simplest materials serve for these employments, so that they may be within the reach of children of any class of society, we usually use for this purpose *terra cotta*, or modelling clay, a large piece of which can be obtained for sixpence of any modeller. Or, in the country, where this cannot be obtained, we have taken a lump of common red clay, washed and passed it through a coarse cloth, so as to separate from it the small particles of stone, then have put the jar which contained the liquid clay into a warm oven, until the water had evaporated so far as to leave it of a proper consistence to model with. This is a dirty and very troublesome process, and we only recommend it in cases where nothing else can be obtained for the purpose. This and the modelling clay is more easily worked than any other substance we know of; it has, however, the disadvantage of making the hands dirty, and of being liable to break as soon as the model is dry, as the clay in this state is exceedingly brittle. Another substance, which has neither of these disadvantages, is ground rice properly prepared. This may be a little more difficult to model with than clay for very young children, but older ones usually prefer it. The models made with it are light, and when dry are difficult to break; this substance will also admit of a very high polish. It is, however, very difficult to prepare. Besides the above, modelling wax, putty with the smell taken from it, or gutta percha can be used. The gutta percha is certainly durable, but this is almost all that can be said for it, as it possesses little or no beauty, and as it must be made and kept soft while being worked, by being constantly dipped in hot water, it is impossible for young children to use it, and it is indeed so tough and sticky that it is quite uncomfortable to work with the fingers. We have mentioned these substances (adds the lady) as they are occasionally used, but clay or putty will be found to answer every purpose."

Our proposed pupils would not, however, be quite so nice about the material—only the further removed from the abortive mud or dirt pie of time honored (juvenile) antiquity—the better. Now, then, our modelling commences simply with taking a small piece from off the large ball of clay and rolling it round. That is a simple process. Well, another and smaller piece may next be taken off and also rolled round—that is equally simple; but, in fact, the whole stages of elementary modelling are perfect simplicity; for, when these two round bits of clay are placed one on the top of the other, and the top of the smaller and upper ball marked with a cross by the modelling knife,*—the incipient artist comprehends immediately that his first effort of genius has been accomplished, —he has modelled a loaf of bread! After that, he may venture on modelling a bird's nest,—by taking a large piece of clay, rolling it round between the hands, and then passing a finger into the centre of the ball so as gradually to increase the width and depth of the hollow. The sides and top of the nest being then pricked over with the point of the modelling-knife, some small pieces of clay rolled up and dropped into the nest represent the eggs. The aspiring artist is now prepared to attempt animated nature. With the utmost ease he may model a swan or a duck.

We need not go minutely into what seems almost intuitive, but the first notion of every one by whom this process, simple as it is, has not been carefully examined, is that the difficulties of executing artistic models of anything are infinitely greater than there is ever any chance of their being found. The rudimentary operations now explained are capable of being indefinitely extended, not only from a loaf of bread to a bird's-nest, and from a bird's-nest to a basket of flowers; but the variations of floral structure present themselves in turn for study, and it being once found out how slightly a bluebell differs from a primrose, the distinctive characteristics of every flower that grows will, by the dawning intelligence, be ultimately detected and copied.

There is just one other illustration derived from the Kinder-Garten amusements which we would seek to illustrate, as it is sure to prove popular round the cottage hearth, when brushed up and warmly glowing, as the oil lamp sparkles in the eager eyes of the pleased group assembled round to reproduce the fancy structures about to be noticed. This is called pea-work. It cannot be pretended that it has a bearing of equal importance to the art of modelling, or that it is anything more than mere play. But as play, it is of an innocent and imitative character, and commends itself, in its higher aims, even to the artistic consideration.

Models may be formed bit by bit, of any structure however complicated, by thin little bits of pointed stick inserted at their ends into two peas, which afford, of course, the means of jointing on to any others in almost any direction. Architectural models are most readily copied from an engraving.

By introducing such amusements, the occupation that is secured for hours of relaxation is, therefore, greatly enhanced by their tendency to educate the constructive faculties and induce workmanlike accuracy and mechanical study. These hints are thrown out regardless of the sneer that may be expected at their frivolity. There is no doubt that such pursuits are frivolous; but there is as little doubt of the truth of the hackneyed adage, that "All work and no play makes Jack a dull boy." It is expressly as play, in contradistinction to work, that they ought to be introduced and promoted; and happy would it be for us if in all our frivolous and favourite amusements we could find the germs of usefulness and refinement as we do in these.

* The modelling knife is a piece of hard polished wood, 4 inches long; one end flattened and slightly rounded, and coming to a point at the other.

Marylebone Literary and Scientific Institution.—On the 16th December a well-attended meeting was held at this Institution. Lord Fermoy was in the chair, and, in his opening speech, said the object of that meeting was, by public subscriptions, to raise funds to take the Institution out of its difficulties. The secretary read the report of the committee, who said they very much regretted that, unless support were given them, they should be obliged to close the Institution; and, further, that the President (Sir Francis Goldsmid) had lent them £500, and promised to give it to them if £500 more could be raised, and they had therefore resolved to call two meetings for the purpose of soliciting assistance from the public. One of the speakers observed that books were at one time the strength of these Institutions, but there had been a great change; the circulating library of to-day was not the same as that of thirty years ago. The committee of the Institution had decided to add 7,000 new books to the 7,000 old if the Institution were kept open.—Serjeant Parry proposed a resolution tendering Sir Francis Goldsmid, the president of the Institution, hearty thanks for

his offer. He believed that this Institution was the oldest of its kind, except the London Mechanics' Institution. About £200 was subscribed at the meeting.

Richmond Young Men's Society.—A *conversazione*, to celebrate the opening of the new rooms in George-street, was held on the 1st, 2nd, and 3rd December. On each evening the rooms were crowded. W. J. Maxwell, Esq., procured the services of a gentleman from the Polytechnic Institution with the piping bullfinch which created such a sensation at the International Exhibition in 1862. There was also a fine exhibition of valuable paintings, lent by the residents in the neighbourhood, and a collection of antiquities, arranged in periods. A paper was read by W. Chapman, Esq., descriptive of the Royal Palaces of Richmond from the earliest period of its history. The Rev. W. Webster, Minister of the Montpelier-row Chapel, Twickenham, read a paper on "Brotherly love towards each other," and the Rev. G. S. Ingram, of the Independent Chapel, Twickenham, also read one on "The mission of beauty in the works of utility." A concert was given each evening in the large room.

South Staffordshire Educational Association.—The committee have recently decided to admit Working Men's Clubs of the district into Union with the Association for General Purposes, at a nominal subscription of four shillings per year, and have also decided to appoint a paid examiner in connection with the examinations of the Central Committee, instead of trusting to honorary services as heretofore. The night-school movement in South Staffordshire is rapidly extending, no less than twenty additional schools having been admitted into Union this season. The principal feature of Institution work appears to be the very general substitution of penny readings and entertainments for ordinary lectures, which are said to be inadequately supported. The third series of Saturday Evening Concerts has been commenced at Wolverhampton, and the performances are quite as popular as in former years. The Willenwall Institute Readings are also remarkably successful. At the Young Men's Christian Institute, Wolverhampton, a recreation or "club" room has been added. It is proposed to have, in addition to games, social meetings, and musical gatherings weekly. At Wednesbury, Mr. James Russell is erecting, at the Crown Tube Works, an extensive building, which will form an Institution for his numerous workpeople. It will contain a large lecture and concert hall, reading-room, library, and two rooms for night-school purposes. At Dudley, the Committee of the Mechanics' Institution are preparing for the opening of the new building on the 29th instant, when the Earl of Dudley, Lord Lyttelton, Lord Lichfield, and others, will take part in the proceedings, which will be followed by a bazaar in aid of the building fund. This building is by far the most commodious and extensive one, for special Institution purposes, which South Staffordshire can boast. In addition to the usual rooms there is a large public hall, a lecture-room, a laboratory, well-stocked geological museum, and suitable class-room and attendants' apartments. The total cost will be between five and six thousand pounds.

Fine Arts.

SCHOOLS OF FINE ARTS IN PARIS.

The following documents relating to the School of Fine Arts in Paris, which has just been completely reorganized, have a special interest at the present time, whilst the reform of the Royal Academy is under discussion:—

Paris, 14th Nov.

Sire,—In connecting Fine Arts with the administration of your household, your Majesty wished to show all the interest you take in them; you have brought them so near the throne as to give them a personal attention. The first question which has called for the solicitude of your Majesty, and for which you have ordered an examination, concerns the organization of the Imperial Special School for Fine Arts, which takes its origin from 1819, and has ceased to harmonize with the advance of ideas and the wants of the present time. I have the honour to submit to your Majesty a proposed decree, which, separating the administrative departments from those for instruction, reconstitutes this establishment upon new and normal bases, of which the principal arrangements will in the end do away with privileges and restrictions incompatible, in the present day, with the liberal principles by which your Imperial Majesty's Government is directed. The report which has been referred to me by M. the Superintendent of Fine Arts, and which I have placed before your Majesty, contains all the necessary explanation for the appreciation of the scope and nature of these innovations. I approve of all the conclusions in this, and I pray your Majesty to affix your signature to the annexed proposed decree.

(Signed) Vaillant (Marshal.)

Napoleon, by the grace of God and the goodwill of the nation, Emperor of the French.

Greeting to all present and to come.

Read the order of the Republican Government, dated 3rd *Pluviose*, 11th year (22d January, 1803).

Read the Royal ordinance of the 4th August, 1819.

Upon the report of the Minister of our Household and of Fine Arts, have decreed and do decree what follows.

Imperial and Special School of Fine Arts.

Art. 1. The administration of the Imperial and Special School for Fine Arts is confided to a director appointed for five consecutive years by the Imperial decree. The director is the immediate head of the staff of the school; he is alone charged with the carrying out of the ministerial decisions and administrative rules. He corresponds with a superior office, concerning the business of his department. All the expenses must be authorized by him, within the limits, and according to the conditions laid down by the Minister. He watches these expenses and controls them, and causes vouchers to be established, keeping within the rules of the public account.

He enjoys a salary of 8,000 francs (£320). In case of illness or holiday his place is filled up by a person nominated by the Minister.

Art. 2. The administrative staff comprehends—a secretary, an accountant, a keeper of models and objects of art, and a librarian.

The staff for instruction comprehends—professors for courses, professors chiefs of studios. All are named by the Minister as well as those employed in the service.

The provisions of the Law of 9th June, 1853, for civil pensions are applicable to the whole staff of the school except the professors, chiefs of studios.

Art. 3. The professors for the courses receive an annual salary of 2,400 francs (£96). In case of illness, or absence, they are replaced by a person chosen by the Minister. The salary is then divided between the substitute and the professor.

Art. 4. The titles and privileges of the present professors and those who are superannuated are suppressed; nevertheless, the professors who are at present in possession of the superannuation will preserve, under the report of the salary, the advantages for them resulting from the 9th Article of the rule annexed to the ordinance of the 4th August, 1819.

Art. 5. The professors chiefs of studios, independently of the localities which are conceded gratuitously to them for the installation of their studios, are remunerated by means of indemnities worth about 2,400 francs (£96) a year. They cannot take part in the Superior Council for teaching which is established near the school, as will be shown in the second chapter.

Art. 6. The professors do not live in the school.

Instruction.

Art. 7. In connection with the school a Superior Council is established, which is composed of—a superintendent of fine arts—president; a director for the administration of fine arts—vice-president; two painters, two sculptors, two architects, one engraver, and five other members, named by the Minister.

The Superior Council chooses its secretary from the members of the Council. The members of the Superior Council for Instruction, with the exception of the superintendent of fine arts, and the director for the administration of fine arts, are renewed by one-third at the commencement of each academic year. The members leaving office can be elected again. The functions of the Superior Council are gratuitous.

Art. 8. The imperial and special school for fine arts is entirely devoted to the teaching of painting, sculpture, architecture, and engraving, in copper-plate, medals, and precious stones.

Art. 9. The following courses are given by the staff of the school:—

1. History of art and æsthetics. 2. Anatomy. 3. Perspective. 4. Elementary mathematics. 5. Descriptive geometry. 6. Geology, elementary physics, and chemistry. 7. Administration and book keeping. construction and application in work-yards. 8. History and archæology.

Art. 10. The power of giving lectures temporarily in the rooms of the school can be accorded to a person not on the staff of professors, so long as the subject of the lecture is connected with the study of fine arts and the use of it is recognized by the Minister.

Art. 11. The daily exercises prescribed by the 3rd Article of the rule annexed to the ordinance of the 4th August, 1819, are replaced by works executed by the students in the studios. For this purpose, attached to the school, are—Three studios for painting, three studios for sculpture, three studios for architecture, one workshop for engraving copperplate, one workshop for engraving medals and precious stones. These workshops and studios are directed by artists who hold the title of professors, heads of studios, as has been stated in Article 2.

Art. 12. Every three months the director receives a report from the professors, heads of studios, on the progress of their pupils. These reports are communicated to the superior council. The council informs the minister of those students who, having distinguished themselves, seem to him to deserve either prizes or encouragements.

Art. 13. The obligations are:—That all the pupils of the school attend the courses of history, æsthetics, and of archæology. That all the pupils who learn painting, sculpture, and engraving, attend the courses of anatomy and perspective. That all the pupils learning architecture attend all the courses except anatomy.

Admission of Students.

Art. 14. The candidates who wish to go through the courses of the school ought to forward their names to the secretary, certify to their being French, and be between the ages of 15 and 25. Strangers can exceptionally, and with the consent of the minister, be admitted to the course.

Competition for the great Rome Prizes, and for Laureats.

Art. 15. The competitions for the great Rome Prizes are open to the Imperial and Special School for Fine Arts. All artists, from the ages of 15 to 25, whether pupils or not at the school, can compete for the great Rome Prizes, after having succeeded in two preliminary tests, on the condition that they are French. After two preliminary tests, ten candidates will be admitted to compete for the prizes for painting, sculpture, architecture, and engraving on copper-plate, medals, and precious stones. For the first three sections above named, there will be an annual competition; for the fourth, one every two years; and for the fifth, one every three years.

Art. 16. The programme of the preliminary tests and the definite competition is drawn up by the superior Council for teaching. instituted by art. 6; the results of the tests and the competition are decided by a jury composed as follows, of—Nine members for the section of Painting, nine members for the section of Sculpture, nine members for the section of Architecture, five members for the section of Engraving on copperplate, five members for the section of Engraving medals and precious stones. The jury will be drawn by lots, from a list, which will be prepared by sections and presented by the superior Council. This list, having been checked by the Minister, will be inserted in the *Moniteur*. The juries of each section will only decide at the competition of the section for which they have been named.

Art. 17. One prize only will be awarded in each section.

Art. 18. The provisions of paragraph 6 of the 14th article of the law for recruiting for the army, are, and still remain, applicable to the candidates who take the great prizes.

Art. 19. For the future, the candidates who obtain the great prize in their section, and who are sent to Rome, will only receive pensions for four years. They are obliged to stay at Rome two years at least; for the other two years they may, if it is convenient, and they like to, devote them to instructive journeys, informing beforehand the superior administration of their intentions. The engravers of medals and precious stones enjoy the pension only for three years, and they ought to remain at Rome for at least two years.

Art. 20. The Director of the Imperial Academy of France at Rome sends a report, every six months, to the Minister, of the works and degree of instruction of the prizemen.

General and Transitory Arrangements.

Art. 21. The ministerial orders determine:—

1. The conditions for the admission of students into the studios of the Imperial and Special School for fine Arts—the maximum length of their stay at the school—the commencement of the courses—the number of lessons—and the details relative to teaching.

2. The relative measures for the studies of the pensioners—their travels—the obligations they have to fill up—the mode of judgment or the appreciation of their works.

Art. 22. The candidates actually in possession of the title of pensioners of the Government will always preserve their rights in what concerns the length of their stay at the Imperial Academy of France at Rome, but they will be put under the regulations of the 21st Article as above.

Art. 23. The provisions and ordinances and past rules are repealed as far as they are contrary to the present decree, which will come into force 1st January, 1864, and which the Minister of our Household and of Fine Arts is instructed to carry into operation. This decree will be inserted in the *Bulletin des Lois*.

Done at our Palace of Compiègne, the 13th November, 1863.

(Signed) Napoleon.
(Counter-Signed) Vaillant.

Napoleon, by the Grace of God, &c., &c.,

Read the Imperial Decree dated this day, relating to the organisation of the Imperial and Special School for the Fine Arts.

At the proposition of the Minister of our Household and the Fine Arts.

Decreed and do decree the following:—

Art. 1. M. R. Fleury, Member of the Institute, is nominated for five years Director of the Imperial School for Fine Arts.

Art. 2. The Minister of our Household and of the Fine Arts is charged with the execution of the present decree.

Done at our Palace of Compiègne the 13th November, 1863. (Signed) Napoleon.
(Counter-Signed) Vaillant.

Precis of a letter from the Comte de Nieuwerkerke to the Marshal of France.

Referring to the old system by which the Imperial and Special School for Fine Arts was carried on, the following suggestions are now offered:

1. The creation of an office of director in the school.
2. Reform in the system of nomination of professors.
3. Creation of new professorships for painting, engraving, &c.; also of preparatory studios directed by professors chosen by the administration.
4. Opening of courses, gratuitous to the School for Fine Arts, given by every person presenting a programme to the administration, which promises useful instruction.
5. An Institution in connection with the School for Fine Arts, and a superior Council for Instruction.
6. Suppression of preparatory tests.
7. The appointing of the limit of the age to 25 complete years, for the competitions of the great prizes.
8. Suppression of the second prizes.
9. Reduction to four years of the pension awarded to prizemen, of which two years must be passed in Rome and two others in travelling.
10. Suppression of the great prizes for landscape painting.
11. Augmentation of the pensioner's superannuation.
12. Introduction of special jury for judging at the competition for the great prizes.

The late William Mulready, R.A.—The Memorial Committee have resolved to recommend to the subscribers the following plan:—First, to erect a suitable monument over the grave of the artist at Kensal-green; secondly, to offer a bust of him to the Trustees of the National Gallery or of the National Portrait Gallery; and, thirdly, to devote any surplus to the establishment of a Mulready Prize to students.

South Kensington Museum.—Mr. Godfrey Sykes and his assistant have been busy during the autumn in decorating parts of the new courts and galleries, which will be re-opened to the public during the Christmas holidays.

Manufactures.

Porcelain Thermometers.—An improved porcelain thermometer, manufactured by Messrs. Frankham and Wilson, was laid on the table at the last evening meeting. In ordinary thermometers the tube is partially let into a groove, so as to bring the column of mercury as near as possible to the graduated scale, but as this cannot conveniently be done in a porcelain instrument, the tube is flattened, and increased facility is thus given for reading off the temperature indicated. In this instrument the scale is in each case graduated to the tube.

Production of Cast-steel directly from Pig-iron.—The foundation of this new method is the influence of steam on a thin stream of pig-iron. If we take an iron tube of a certain diameter with sides of the necessary strength, form a ring out of it, and fix on its circumference, towards the centre, three or more tubes, we have a tube ring with three or more radii. The ring is made fast to the tubular pipe; the ends of these tubes, which are open, do not quite reach to the centre of the ring, and have, therefore, between the ends an empty space, in which the pig-iron is allowed to flow in a stream of a certain strength. The steam let into the boiler from the tubular pipe flows out of the openings of the three tubes, and operates directly upon the pig-iron. It is said that the oxygen of the steam oxidises the carbon of the pig-iron, the silicium, a portion of the sulphur, phosphorus, and other impurities in the pig-iron; the hydrogen combines with the carbon, sulphur, phosphorus, arsenic, and other bodies, with which it forms combinations of hydrogen. The carbonised and purified metal falls into the crucible or other vessel placed immediately under the apparatus. The metal obtained contains impurities, and must therefore be smelted in crucibles in a blast or reverberatory furnace. This is the essential part of the process. Now arise the questions:—Is it possible to obtain steel in large quantities by this method; will it be of the same quality as the small quantity obtained on trial; and, if it is possible, at what price can it be obtained? In answer to these questions Cazanave asserts that by his method steel can be obtained in great quantities, not inferior to the best steel, and proportionately cheaper; for his best quality steel can be obtained for £18 per ton. This is difficult to believe, but the inventor affirms that it is so, and at the same time warrants the excellent quality of his steel. In the present mode of obtaining steel, good iron must be used which is cemented, and the cemented iron, that is the steel, is smelted in crucibles. By Cazanave's method cementation of the iron is avoided, so that the cast-steel may be obtained in unlimited quantities. If this new method turns out practicable, it will be possible to work up the whole daily production of a blast-furnace into steel. For this only the apparatus is required, which is not very costly, and which would be erected near the blast-furnace and stream of pig-iron. The stream would be divided into rays of the necessary strength, and each one directed into an apparatus. By Bessemer's process about ten tons of steel are obtained per day at Sheffield, while by Cazanave's method between sixty and seventy tons per day could be obtained, and a blast-furnace is being erected at Charleroi which will produce about seventy-four tons per day. The samples of steel furnished by this new process are reported to be very good. They were obtained from pig-iron smelted with coke, but it is supposed that charcoal pig-iron would give better results.

Preservation of Corn.—An experiment has been made in Paris for the preservation of corn from fermentation and the attack of insects, by enclosing it in a metal vessel and exhausting the air. Ten hectolitres of wheat were placed in the vessel, and the air having been exhausted, the vessel was opened after fifteen days, and the weevils, which were seen quite lively when the wheat was placed in the vessel, had quitted their cells and were dead. They were warmed, but did not stir. Being placed on white paper, they were crushed and reduced to powder, without leaving any stain on the paper. From various experiments made on wheat under glass, it was found that the weevil retains life longer than any other insect when deprived of air.

Influence of Oxygen in Wine-making.—At a recent meeting of the French Academy of Sciences, M. Pasteur communicated a paper "On the Influences of the Oxygen of the Air on Vinification." According to the author's researches, the must of grapes contains no oxygen; the only gases he found were carbonic acid gas and nitrogen. As, however, oxygen is necessary to fermentation, which proceeds more rapidly in proportion to the amount supplied, M. Pasteur proposes to aerate the must by means of bellows, or otherwise. The author considers that oxygen is the active agent in "vinification" as well as in fermentation, and that, in fact, it converts new wine into old. Its action, however, must be prolonged, otherwise the ill effects described by Berthollet will be produced. M. Pasteur points out that the larger the casks the longer are the wines in coming to maturity, and the bottling of wines, by diminishing the aeration, prolongs the keeping.

Pigment and Writing Ink.—Mr. Thomas de la Rue has patented the use of aniline dye waste grounds, with carbon and other ingredients, with the addition of glycerine and gum tragacanth, in the preparation of inks. For other purposes of a similar character he uses gluten dissolved in acetic acid, and a solution of the drug salep.

Commerce.

Sugar Duties.—The *Overland Commercial Gazette*, Mauritius, 6th November, says:—"The movement which is taking place in England in favour of the equalization of the sugar duties is seen with much satisfaction here, and with the powerful aid of the *Times*, which is brought to bear on the question, we have good reason to hope that it will obtain a favourable solution. The injustice of the present differential duties is clearly exemplified here. We have about one hundred estates with vacuum apparatus, all of which manufacture a superior kind of sugar fit for consumption. Scarcely any of this sugar is sent to England, because other markets, where more equitable tariffs exist are disposed to pay better prices for the better article. It is very fortunate for Mauritius that Bombay has become a market for fine crystallized vacuum sugar, otherwise we should have been dependent on Australia alone, which could not take all of that quality made. Nothing would have remained but to send it to Europe, where the higher rate of duty would reduce the net price to that of inferior quality. In this position of things all further improvement in manufacture is checked, but if the duties were to be equalised, no pains, expense, or skill would be spared to produce sugar fit for consumption without any further process; and to so manufacture what is termed the 'sirop,' or second and third boilings, as to improve it in colour, grain, and purity. With an equalized duty, all sugar would be made by the vacuum process; it is as cheap a system of manufacture as the old-fashioned one still adopted on many estates, and is more economical. There can be no doubt of the economy, for the process of improving and refining in Europe must add considerably to the cost. But instead of improving, we are encouraged to retrograde, under the present duties. Deprive us of Australia and Bombay as markets, and we should be obliged to study to reduce the quality of our sugar, so as to gain for it admittance into the European markets at the lower rates of duty."

Silk.—The last accounts from the silk market of Aubenas, in the department of the Ardèche, state that there is still a great deficiency in the supply of raw silk, holders not being inclined to sell at the present price. The markets of Joyeuse are rather better supplied. Silk grown at Broussa has experienced a decline.

Obituary.

The Venerable Richard Lane Freer, D.D., Archdeacon of Hereford, born February 10, 1806, died August 11, 1863, was son of the Rev. T. Lane Freer, M.A., Rector of Handsworth, Staffordshire, and a descendant in direct line of that Miss Lane, sister of Col. Lane, who effected the escape of Charles II., after the battle of Worcester, by carrying him behind her on horseback to the neighbourhood of Bristol. Archdeacon Freer was educated at Westminster, whence he went to Christchurch, Oxford, where he graduated as B.A. in 1828. In 1830 he was ordained Deacon by Bishop Cornewall, of Worcester, and the next year Priest. He took his degrees of M.A. in 1834, B.D. in 1839, and D.D. in 1858. In 1838 he was presented to the Rectory of Bishopstone-cum-Yazor, in Herefordshire, by Sir Robert Price, Bart.; in 1847 to a prebendal stall in Hereford Cathedral, by Bishop Musgrave; in 1852 to the Archdeaconry of Hereford, by Bishop Hampden; and in 1861 to the Prælectorship of Hereford Cathedral, by the Dean and Chapter. He was a Freemason and Deputy Provincial Grand Master of Herefordshire, and was a magistrate for the County of Hereford. He published in 1832 "A few plain words on the Sacraments of the Church of England;" in 1837, devotional hymns, three single sermons, and his Primary Charge in 1852. He married, in 1848, the daughter of the Rev. John Clutton, D.D., Canon Residentiary of Hereford Cathedral. He restored the church of Bishopstone, and beautified with oak carving and painted glass the Church of Yazor, and built the spire. He was elected a member of the Society of Arts in 1853.

Mr. Godfrey, Bandmaster of the Coldstream Guards, died recently. He had filled this position for nearly forty years. Some of the most popular instrumentalists of the day had been under his tutorage. Mr. Godfrey was in his 75th year. Members of the Society will remember how pleasantly the performances of the band under his direction have enlivened our *conversazioni* at the South Kensington Museum.

Captain James Johnston McCleverty, C.B., R.N., died at Florence on the 1st of March, 1863. He was the youngest son of Major-General Sir Robert McCleverty, C.B., K.C.H., and grandson of Captain William McCleverty, R.N., of "Glynn," near Larne County Antrim, who went round the world with Lord Anson, and died at Waterford, in command of the West Coast of Ireland, in 1779. The subject of this notice joined H.M.S. *Hussar* on the 6th of April, 1823. In 1826 he joined the *Asia* under Sir Edward Codrington, and was present at the battle of Navarino. He afterwards was with Sir Pulteney Malcolm in the *Britannia*. At the special request of King William IV. he was made lieutenant, and in 1833 was appointed to the *Castor*. In 1835 he joined the *Etna* as first lieutenant, on the Coast of Africa station. In 1839 he was lent, by the Admiralty, to the Indian Government, and proceeded on a secret mission to Calcutta, from whence, in 1840, he joined Admiral Sir William Parker in China, having been given the command of the *Phlegethon* by Lord Ellenborough, and was made commander for the action he fought off Ko Tee Point in 1841. In 1846 he was appointed to command the *Polyphemus*, and received his post-rank for the action and recapture of the *Three Sisters* from the "Rif" pirates on the 8th November, 1848. In 1853 he was appointed to command the *Terrible* during the Russian war in the Black Sea. For his services here he received the C.B. The late Lord Lyons wrote of him to the First Lord, "He is ubiquitous and his worth is equalled by his modesty." In 1858 he was appointed to command the *Cambrian*, and proceeded to China, where his services procured him the "good service pension," and in 1861 he became Commodore in the Indian Seas. He was seven times mentioned in the *London Gazette*. He was elected a member of the Society of Arts in 1862.

William Pierce, of Jermyn-street, St. James's, was born at Benthall, Shropshire, April 10, 1799. He devoted his whole life to improvements in warming and ventilation, more especially in relation to the cottages of the poor. On these subjects he published several small treatises, one of which was dedicated to the late Earl de Grey, who had been for thirty years his warm supporter. Mr. Pierce received the silver medal from the Society of Arts for the Pyro-Pneumatic Stove-grate, invented by him in 1848. He died at his residence, Belsize-road, Hampstead, October 1, 1863. He was elected a member of the Society of Arts in 1849.

Publications Issued.

Treatise on Mills and Millwork, Vol. ii. On machinery of transmission, and the construction and arrangement of mills, viz., wheels, shafts, and couplings; engaging and disengaging gear; mill architecture; also corn, cotton, flax, silk, and woollen mills; with a description of oil, paper, and powder mills, including a short account of the manufacture of iron. By William Fairbairn, LL.D., F.R.S., with plates and wood engravings. 8vo., price 16s.—(*Longman.*) The first part of this work gave a succinct account of the experience of nearly fifty years in the profession of a mill architect, millwright, and me-

chanical engineer. In this volume the author has endeavoured to follow up more in detail the principles of construction and other serviceable data. On prime movers, as comprised in water wheels, turbines, steam engines, &c., the reader is referred to the first part of this work, the present volume being chiefly directed to what is known by the name of mill gearing. It includes an elaborate treatise on wheels; a chapter on the strengths and proportions of shafts, couplings of shafts, engaging and disengaging gear, and those connections by which motive power may be conveyed to a considerable distance. A short treatise on mills and mill architecture is given. The application of architecture to mills was unknown or greatly neglected until late years, when a few examples of architectural construction were afforded by the introduction of slight cornices and pilasters, showing that it was possible at a small cost to relieve by light and shade the monotony of a large brick surface. This, to some extent, introduced a better style of building, and on this subject a few examples have been given. Corn mills are specially treated of, and as these constructions are chiefly in the hands of the millwright, the author has carefully directed attention to the buildings as well as the machinery. A description is given of the floating mill erected for the Government during the late Crimean war, with numerous details of elevators, Archimedean screw, creepers, &c. Four chapters are devoted to mills for the manufacture of textile fabrics. A description is given of the different processes as they exist in each kind of manufacture, while separate chapters are devoted to oil, paper, and powder mills.

The History of Newfoundland from the earliest Times to the Year 1860, by the Rev. Charles Pedley, of St. John's, Newfoundland. 8vo., with a large map, price 16s.—(*Longmans.*) The author had access to the colonial records, and has endeavoured to give everything of importance that can throw light upon the growth of the summer fishing station into a thriving colony. While he has endeavoured to relate impartially the long struggle between vested interests and what may be called the natural law of settlements, the peculiar nature of the sources from which Newfoundland derives wealth and importance is shown to have given rise to international rivalry and exciting disputes, not yet by any means settled. The volume is completed by several appendices, embodying antiquarian details, and the most recent commercial and social statistics of the island.

The Yard, the Pendulum, and the Metre, considered in Reference to the Choice of a Standard in Length, by Sir John Frederick William Herschel, Bart., K.H. (*Longmans.*) The object of this essay is to set forth the several conditions which any standard or typical unit of length which shall be assumed as the basis of a system of measures and weights intended to be national, and which may justly claim to be universal, ought to fulfil; and to compare with their conditions our actual standard, the French metre now in use, and the length of the pendulum which has been often proposed as a natural unit of length. The inquiry Sir John Herschel divides into two questions—what is intrinsically the best and most available unit of lineal measure; and what system of numerical multiplication and aliquot subdivision of such unit for measures of length, and of its derivative units of area, of capacity, and of weight; for these he considers all refer themselves naturally to the unit of linear measure, or ought to do so. In effecting a practical change, it is evident we may resolve with logical consistency to put aside our present system altogether, and adopt the metrical one in preference, or we may retain the present fundamental foot or yard, and decimalize our system of denominations; or by a slight, and, practically speaking, imperceptible change in our present standard, bring it into conformity with our views of theoretical perfection. We may, too, retain all existing denominations as far as convenient, and superadd by permissive legislation a decimal system for facility of calculation, relying on its practical utility for driving out the old system with which it would be brought in contact. This last is the course Sir John Herschel prefers. He, however, reviews the whole subject and the various proposals that have been put before the world. In the linear dimensions of the earth on the one hand, as the linear measure of its attractive force embodied in the pendulum on the other, Sir John considers the two only available sources for a universal and invariable standard; the French, after considering both, threw aside the pendulum in favour of the metre, or the ten-millionth of the meridian quadrant; while the English, by Act of Parliament, in 1824, repeated the old standard of an organic type, and in effect adopted the pendulum as their ultimate resort. The objection to the pendulum lies in the uncertainty which must always prevail as to the true length of that normal pendulum which shall stand equally related to the whole globe. The pamphlet discusses how far the French metre fulfils the requirements of scientific and ideal perfection, and points out the objections to it.

International Commercial Law, being the principles of Mercantile Law of the following and other countries, viz., England, Scotland, and Ireland, British India, British Colonies, Austria, Belgium, Brazil, Buenos Ayres, Denmark, France, Germany, Greece, Hanse Towns, Italy, the Netherlands, Norway, Portugal, Prussia, Russia, Spain, Sweden, Switzerland, the United States, and Wurtemburg. By Leone Levi, Esq., F.S.A., F.S.S., of Lincoln's Inn, Barrister at Law, Professor of the Principles and Practice of Commerce in King's College, London, Doctor of Political Economy, &c., &c. (*V. and R. Stevens, Sons, and Haynes, Bell-yard.*) Second edit., 2 Vols., Roy. 8vo., 35s. The first edition of this work obtained in 1854 the Swiney prize for the best work on Jurisprudence, at the hands of the Society of Arts and College of Physicians, and for the same work the King of Prussia and Emperor of Austria have awarded to the author their great Gold Medal for Science and Art, and now a new edition has been published with some essential differences. The first edition was in two vols., quarto, and it contained the Law of the United Kingdom at the head of each page, and the Codes and Laws of Commerce in parallel columns under it. This edition is in two volumes, royal octavo, and gives under each subject first, the British Law, next the Colonial, and next the Law of Foreign Countries. The present edition of the work contains, however, more branches of the law than were embraced in the first. The work is divided into thirty chapters, including the rights of commerce in time of peace and war, sources of commercial law, law relating to trading and traders, partnership, commandite partnership, joint stock companies, principal and agent, hiring and service, contracts, contract of sale, bills of exchange, cheques, banking, bank-notes, guarantees, negotiable instruments, patents, copyright, international copyright, trade marks, shipping, affreightment, carriers, marine insurance, general average, life, fire, and accident insurance, bankruptcy, foreign attachment, arbitration, and courts for the administration of commercial law, including tribunals of commerce. The Patent Law of different countries is fully described. There are first the British law, and afterwards the law of France, the United States, Germany, Austria, Belgium, Greece, Italy, Mexico, the Netherlands, Norway, Prussia, Poland, Portugal, Russia, Spain, and Sweden. The same fullness is observable upon the law of Copyright. The following extract from the preface indicates the exact nature of the work:—"It is the object of the present work to bring the fundamental principles of the law merchant, and the rules which have been superadded to them in different countries, into contact with each other; so that we may profit by each other's experience, and at the same time gather materials for the attainment of a solid and permanent progress in mercantile legislation. The chief advantage of such a work is the ready access it affords to the existing laws of the principal countries of the world. Other works on commercial law, such as Smith's or Chitty's, are confined to the laws of England. In this the field is enlarged, and the laws of foreign countries are put side by side with our

own, because commerce is essentially international, and we are deeply affected by the laws and procedure of other states. Hence the distinctive title of 'International' Commercial Law. The science of international law has hitherto been limited to the political relations of states but recently not a few special conventions relating to commerce have been formed, such as those relating to international copyright, trade marks, and public companies. The portion, moreover, called private international law, contains provisions intimately affecting the interests of merchants, whilst a great branch of international law proper consists in settling the rights of commerce in time of peace and war, which forms the subject of the introductory chapter."

Notes.

The Death of M. Gounelle, one of the directors of the French telegraphic administration, and the author, conjointly in many cases with M. Blavier, of valuable contributions to the science of electro-telegraphy, occurred recently. M. Gounelle was indeed the father of electro-telegraphy in France; for in 1843, under M. Foi, then at the head of the administration, he constructed the first trial line from Paris to Rouen, and, M. Bréguet confirmed the observations of Steinheil relative to the expediency of using the earth for one-half of the circuit.

Telegraphic Improvements.—*Galignani* states that the new system of telegraphic correspondence established by the Bonelli Company between Machester and Liverpool has lately passed with success the ordeal of proof in France. The lines between Paris and Boulogne having been accorded to the Chevalier Bonelli, the new instruments were attached, and worked admirably during the period for which the wires were granted. The perfect clearness of the letters reproduced at a distance, the rapidity of the new system, which secures an average of more than 300 dispatches of 20 words per hour printed in duplicate, as well as the simplicity of the means employed, astonished all who witnessed these experiments. The inventor has received authority from the director-general of telegraphs in France to establish the "typo-telegraph" by way of test between the Bourse and the central offices, in order to see how far it may replace with advantage the system of couriers now in use.

Female Candidates for Examination.—The *Englishwoman's Magazine* says that the number of female applicants for examination in the papers which have been prepared for the Cambridge local examinations, is very large. There will be examinations both for senior and junior students. The former must be under eighteen and the latter under sixteen years of age. There is considerable difference between these examinations and those instituted by the Society of Arts. In the latter the certificates given are for excellence in distinct subjects; while in the Cambridge examinations the attempt is made to set up a general standard of education, and "for this," says the *Englishwoman's Magazine*, "we are exceedingly grateful." The university authorities, however, do not offer to women any degree, nor do they admit girls to the examinations, and all that has been done is to send to a committee of ladies and gentlemen copies of the examination papers, "for the use of some girls in London," while the Society of Arts places them on a par with the other sex, giving them the same opportunities of obtaining the prizes and certificates offered.

Correspondence.

Utilisation of Metropolitan Sewage.—Sir,—Mr. Thomas Ellis has proposed a plan to the Metropolitan Board of Works for utilising the drainage of the metropolis. The Society of Arts has in bye-gone days recognised the fact that this sewage question is one of deep interest; but the propositions which have hitherto come before you have all been plans for deodorising by chemical and other artificial means. Your Society has from time to time afforded the promoters of these schemes valuable aid, and they have been worthy of it, inasmuch as wherever the sewage of a large town has been so treated, the health of the inhabitants has greatly improved. In the town of Leicester, for example, they began in 1852 to reduce the sewage to solid cakes by the addition of lime, and I happen to have by me the statistics of the number of deaths which occurred during the three following years. In 1852, the deaths were 1773; in 1853, only 1680; in 1854, only 1580; and in 1855, only 1498; and this decrease in the number of deaths was with an increase in the population amounting to 4,000. I am informed, however, that although the great advantage of health was obtained, the solid manure did not turn out so useful to the farmers as was anticipated. We learn from this fact that sewage is spoiled by being dried or in any way solidified. In the progress of agricultural knowledge the following facts will be questioned by very few:—1st. That the metropolitan sewage is a manure valuable for all crops, if properly used. 2nd. That no advantage is gained from using the manure in immoderate quantities. 3rd. That it makes all the difference as to whether it is used in the liquid or solid form: in the solid form it is comparatively useless; in the liquid highly valuable. And in the common sense view of the subject the following facts will be admitted by very many:—1st. That the 266 million tons of the metropolitan sewage, distributed annually on the 20,000 acres of the Quicksands belonging to the Essex coast on the north of the Thames, cannot prove a desirable method to be adopted. It is doubtful whether sand possesses that wonderful deodorising power which is found to be the property of arable land, and the N., N.W., and N.E. wind will carry a detrimental air from this deposit to those who pass it in steam-boats, &c. Also it is probable that our Thames shrimp fishery would be injured, if not destroyed, by such an arrangement. It is apparent, therefore, to common sense, that this scheme, proposed by the Hon. Wm. Napier, and supported in 1851 by the Metropolitan Board of Works, will not fully answer the desired ends of promoting health and purifying the Thames. 2nd. Another common sense view of the subject is—that the ratepayers will be wronged and imposed upon if Sir Wm. Napier's plan is fully adopted. Of this fact some are becoming fully aware, and meetings are being held with a view to urge the Board of Works to consent to the question being referred to Parliament. A meeting of this kind was held recently at the Gladstone, Bishopsgate-street, convened by the Bishopsgate Ward Ratepayers' Association. The following sentiments are extracted from the resolutions carried unanimously at that meeting. 1st. "That this meeting, in view of the evidence laid before the Select Committee of the House of Commons on the Sewage of Towns, and of the analysis of the metropolitan sewage made by Messrs. Hofmann and Witt, is of opinion that the metropolitan sewage is a manure valuable for all crops, and that it can be profitably utilised." 2nd. "That this meeting is of opinion that the interests of the ratepayers and of the nation will be best promoted by the Metropolitan Board of Works at once entering into such an arrangement with Mr. Ellis as will admit of his taking this great question before Parliament." 3rd. "That this meeting is of opinion that the interests of the ratepayers require that Mr. Ellis's offer should be accepted, and that he has fully entitled himself to the confidence and support of the citizens of London." The plan which Mr. Ellis proposes is, that a company should be formed to dispose of this sewage by sale; and he offers the following guarantee, viz.: That he will undertake all the expense and risk of utilising the sewage, and to deposit in bank a sum of £60,000 for the preliminary expenses; and moreover that

he will undertake to protect the ratepayers and the Metropolitan Board of Works, by a special Act of Parliament, from all risk or liability of every sort, and to divide equally with the ratepayers every shilling made by his company. With the most disinterested view to public benefit I should like to say more on this interesting, because important, subject; but for the present I will not trespass further on your space.—I am, &c., R. DART.

THE METROPOLITAN SEWAGE.—SIR,—I see by the resolutions passed, and the speeches made, at several recent meetings of metropolitan ratepayers, that "the analysis of the metropolitan sewage made by Messrs. Hofmann and Witt," and Mr. Ellis's interpretation of the estimate of those gentlemen, are adopted as a basis of the expectations entertained of the great pecuniary benefit to accrue to the ratepayers from the utilisation of sewage. Mr. Ellis maintains that the estimate of Messrs. Hofmann and Witt, of a little over 2d. per ton for the manurial value of the constituents in the metropolitan sewage, refers to the average of the normal sewage and the rainfall taken together. Accordingly, he takes 266,000,000 tons, the estimated annual amount with rainfall, at 2d. per ton; and on the assumption of this rate of value he holds out the pleasing assurance to the ratepayers that their moiety of the profit, arising from the adoption of his scheme of utilization, would be "an annual sum of not less than £700,000." I, on the contrary, have repeatedly maintained that it is perfectly clear, from the report of the Main Drainage Referees, embodying that of Messrs. Hofmann and Witt, that their estimate of 17s. 7d. per 100 tons, or a little ovor 2d. per ton, refers to the normal sewage without rainfall; and, accordingly, in calculating the total annual value they took into account only the amount of sewage exclusive of rainfall, which may be stated, in round numbers, as averaging only about three-fifths of the total quantity inclusive of rainfall. I further maintain that, especially under the then existing conditions, it would have been absurd in the extreme to attempt to determine the average composition of the sewage by the analysis of samples of the essentially variable diluted sewage inclusive of rainfall, unless indeed of specimens taken almost the year round. But all my appeals to the public document itself have been met by Mr. Ellis, and some of the advocates of his scheme, by contradiction, by irrelevant quotations from it, by pretty direct accusations of falsehood, and by unscrupulous and entirely unfounded imputations of unworthy and interested motive on my part in making the statements which it is alleged are untrue. I have thought it only due, therefore, both to the ratepayers, who are so much interested in the matter, and to myself, whose veracity and motive have been publicly called in question, to request statements for publication from the authors of the report. The following are copies of the letters which have been kindly furnished to me by Professor Hofmann, the surviving analyst, and by Captain Douglas Galton and Mr. James Simpson, C.E., the surviving Main Drainage Referees.

Royal College of Chemistry, Oct. 14, 1863.

MY DEAR DR. GILBERT,—On referring to the report made by the late Mr. H. M. Witt and myself to the Main Drainage Referees in 1857, I find you are perfectly correct in stating that our estimate of 17s. 7d. for the manurial value of the constituents in 100 tons of the metropolitan sewage (equal to a little over 2d. per ton) is founded upon the analysis of samples of mean sewage taken from the Savoy-street sewer.

I also find that the amount of sewage which the samples in question were supposed to represent was, according to the information furnished to us by the Referees, taken at 95,000,000 gallons per day, and their report (p. 14) shows that this was the estimated amount of the dry weather sewage.

Reckoning the total amount of the normal dry weather sewage, in accordance with the above information supplied by the Referees, at 95,000,000 gallons per day, or 157,625,250 tons per annum, we arrived at £1,385,540 as the total annual value of the constituents of the metropolitan sewage.

You are at liberty to make any use you may like of this letter.—I remain, &c., A. W. HOFMANN.

London, 4th December, 1863.

DEAR SIR,—With reference to the question contained in your letter of 18th ult., we beg to state that the samples of sewage taken under our direction for analysis by Messrs. Hofmann and Witt for the purposes of our report on the Main Drainage of the Metropolis, were mean samples of *dry weather* sewage taken from the Savoy-street sewer in the manner described in the report, and, from the analysis of these samples, Messrs. Hofmann and Witt estimated the value of the constituents in the metropolitan sewage at 17s. 7d. per 100 tons, or about 2d. per ton. Their estimate refers, therefore, to normal sewage *without rainfall*.—We are, &c., DOUGLAS GALTON, JAMES SIMPSON.

There is no doubt whatever, therefore, that Mr. Ellis has estimated the total sewage, with rainfall, at the value per ton fixed by Messrs. Hofmann and Witt for the sewage without rainfall, and that he has thus, so far as the value is determinable on such data, overstated it by somewhat more than the amount which he informs the ratepayers will be placed at the disposal of the Board of Works for the reduction of local taxation over the metropolitan area, provided his proposition for the utilisation of the metropolitan sewage be accepted.—I am, &c., J. H. GILBERT.

Harpenden, St. Albans.

SUGAR IN DIETARIES—SIR,—In connection with Dr. Edward Smith's paper may I be allowed to draw attention to the anomalous position of sugar. Dr. Smith, of course, included it among the articles of food consumed by the working classes. Mr. Gladstone, in his recently republished speeches, thus states the policy of Sir R. Peel and himself:—"We have been desirous to lower the rates that press on the foreign articles of food, which enter largely, if not into the necessaries of life, at any rate into what may be called the luxuries or the comforts of the mass of the people." This policy appears now to be universally assented to, and to have been fully carried out with the single exception of sugar, and although sugar is not passed over in silence when remissions of duty are annually discussed in connection with the budget, it is only generally referred to as one out of many other items which it would be desirable to reduce in its turn, but the fact of its being the only article of nutritious food heavily taxed is seldom brought prominently forward. From allusions to it in the discussion on the last budget, the House of Commons appear to consider the chief use of sugar is to sweeten tea, at least one of the members for the City of London spoke as anticipating that cheaper tea would be the cause of any great increase in the consumption of sugar; and the fallacy of looking on sugar as an ingredient of liquids, instead of a very desirable and wholesome addition to solid food, appears to be the only reason why more attention is not paid to this single exception to the one great principle of free trade most universally accepted by all parties. There can be no doubt that a duty of about 25 per cent. materially interferes with the use of sugar among "the masses of the people." If it had been treated by the Chancellor of the Exchequer in the same category as rice, &c., probably its consumption in connection with cooked and preserved fruits would be doubled, with very considerable benefit to the consumers; and the very acceptable bounties bestowed on us by a beneficent Providence in our summer fruits, would minister alike to the health and pleasure of all, instead of, as at present, when eaten in a crude and partially ripe state, at once announcing their abundance in the weekly list of the registrar-general by characteristic diseases. The employment of sugar also in preserving animal food is no doubt greatly checked by the present heavy duty, whereas its use in this way might also be greatly extended, and not only make such food more palatable, but also more digestible and nutritious, while giving in addition its own very considerable amount of nutrition, instead of acting as salt does to abstract much of the nutritive qualities of the flesh, and in the large quantity used to preserve such food, contributing in itself nothing required by the stomach. In fact, there can be little doubt that were our

national finances so re-arranged as to admit sugar at a very small duty, and a sufficient supply came into the market, in ten years such a revolution would be caused in the use of sugar as an important article of food, instead of as at present, a kind of condiment, that we should wonder so heavy a duty had been contentedly submitted to for so long a time.—W. Symons.

17, St. Mark's-crescent, Regent's-park.

Dislocations.—Sir,—In the account of a recent action against the London General Omnibus Company, it is stated that the plaintiff, who had dislocated his hip-joint, "was conveyed to the Charing-cross Hospital, where he remained six weeks; then he was seven weeks an out-door patient. He still suffers from an unreduced dislocation, and the leg is permanently shortened by nearly six inches." The jury found a verdict for the plaintiff, damages £800. My present object is, to inquire how it is that a dislocation of the hip-joint is still incapable of reduction, looking at the skill of our hospital surgeons, and the mechanical appliances available. Is it possible that such a hospital as the one above referred to can fail to possess such an apparatus as that of Dr. G. O. Jarvis, of Connecticut, United States, which was introduced into this country about the year 1847, and fully approved of at the time by Mr. Bransby Cooper and other authorities? The instrument was then stated to be capable of reducing any dislocation, from the throat to the hip-joint, and was also of great value in holding the limbs in position so as to enable fractured bones to be more perfectly set. I believe the instrument I refer to was deposited at the Society's house, and I shall be obliged if you can refer me to any printed account of the same.—D. T. S.

The Secretary of the Society of Arts adds:—The instrument was termed a "Surgical Adjuster," for reducing dislocations, &c., and is described in the Society's minute books as intended to set bones which are fractured or dislocated, to be applied to all the superior and inferior extremities, on the long or short bones, and for all fractures where the principle of extension and counter extension is required. The instrument consists of a case 13½ inches long, 1½ inch wide, and ½ inch deep, and is divided within by a partition running lengthwise, into two nearly equal spaces, the one square, into which a rack bar is to be received, the other round, in which is a female screw, and into which the male screw of the femur fork works; this screw is inserted at the upper end of the case, and is used to lengthen the instrument according to the length of the limb to be operated upon. Near the lower end of the case is a rachet wheel, 1¼ inches diameter, with a catch operating therewith. A pinion wheel is fixed on the same shaft as the rachet wheel, but inside the case, the cogs of the pinion wheel working into those on the rack bar. The shaft of the two wheels terminates in a square *hub*, to be received in a corresponding square sinking at one end of the lever, by which the motive power is effected for producing extension and counter extension; the rack bar is turned at the lower end at right angles to the main shaft, to which the bandages are attached. Forks of particular forms to suit different parts of the body, are made to fit on the top of the male screw; rolls of soft materials, belts, straps, pads, and an elongating double inclined plane, complete the instrument. In some cases of severe fracture the instrument is allowed to remain on the patient. When the bones are broken, the contraction of the muscles forces the ends past each other; this instrument is used to draw them back, and to do this in the ordinary way the surgeon requires several assistants, and it sometimes inflicts great pain. It is stated that if a surgeon uses this instrument he will require no assistance, and the whole operation is under his control. It is applicable to the oldest dislocation which it is safe to reduce; the belts and forks are adapted for all the limbs of the body. The instrument is left on in cases of fracture, but not of dislocation. Dr. Jarvis stated that he had used the instrument twice to reduce dislocations of the hip. The limb is perfectly free in its action when the instrument is applied. Evidence of the great efficiency of the instrument was given by Mr. Bransby Cooper and other eminent surgeons, and it was stated to be in use at Haslar Hospital, and also at the Royal Hospital at Greenwich. The Society gave its gold medal to Dr. Jarvis.

MEETINGS FOR THE ENSUING WEEK.

Tues. ...Royal Inst., 3. Prof. Tyndall, F.R.S., "On Electricity at Rest and Electricity in Motion." (*Juvenile Lectures.*)
Thur. ...Royal Inst., 3. Prof. Tyndall, F.R.S., "On Electricity at Rest and Electricity in Motion." (*Juvenile Lectures.*)
Sat. ...Royal Inst., 3. Prof. Tyndall, F.R.S., "On Electricity at Rest and Electricity in Motion." (*Juvenile Lectures.*)

Patents.

From Commissioners of Patents Journal, December 18th.

Grants of Provisional Protection.

Blast cylinders—2902—W. H. Gray.
Boats, propelling—2820—D. Ford.
Buckles for braces—3081—J. H. Brierley.
Carding engines—3047—R. Riley.
Cartridges—2840—H. Gladstone.
Coal, etc., cutting—3034—T. Harrison.
Colouring matters—2892—E. C. Nicholson.
Colours, yellow and orange—3063—J. A. Wanklyn.
Combs—3053—T. Douglas.
Cooking apparatus—3043—E. Stevens.
Cotton gins—3079—W. Wanklyn.
Cranes—2814—J., J., and J. Booth.
Dissolving view apparatus—3089—P. H. Desvignes.
Door fastenings—3109—M. Hillary.
"Drifts," and apparatus for making them—2897—J. Eglin.
Elastic bands—3077—C. Brown.
Fabrics, woven, machinery for finishing or beetling—2799—J. Smith.
Fire-arms, breech-loading—2554—W. Fletcher.
Fires, apparatus for lighting—3024—T. Snook.
Furnaces, &c.—3105—J. Wright.
Furniture—2470—J. Mead.
Gas making—3029—H. Holdrege.
Gunpowder, granulating and drying—2230—T. B. Jordon.
Hand stamp for marking consecutive numbers—3065—A. J. Aspinall.
Hat or cap frames—2734—M. Luneau.
Heat, obtaining and applying—3057—W. Gorman and J. Paton.
Heating water, &c.—3069—F. Piercy.
Hoisting and lowering apparatus—2917—C. Stevens.
Iron fences, &c., connecting and sustaining the bars of—2978—J. A. R. Main.
Joints and catches for brooches, &c.—3067—A. Antill and W. Wilkinson.
Labels to packages, instruments for attaching—2925—W. E. Newton.
Mattresses, cork stuffing for, &c.—3099—A. V. Newton.
Moveable frames and surfaces, fitting—3025—J. Dales.
Mules, lubricating the shafts of the conducting pulleys of—3028—T. T. England.
Partridge canes, bending, &c.—3022—R. Lublinski.
Pencil cases, &c.—3071—M. Turnor.
Plumbago crucibles, &c.—3107—T. V. Morgan.
Projectiles for ordnance, &c.—3087—T. A. Blakely.
Railway breaks—3051—R. A. Brooman.
Railway crossings—3038—C. Cammell and W. Crompton.
Raising or removing grain—3101—H. Audinwood.
Reaping and mowing machines—3095—W. M. Cranston.
Sails, reefing—3035—H. D. P. Cunningham.
Ships of war—3036—C. Lungley.
Smoky chimnies, curing—3026—J. Capper.
Soap—3030—S. Trotman.
Watch case pendant—2943—C. Howard.
Wheels, tires, axles, and axle boxes—2896—W. B. Adams.
Wool carding—3091—H. Eastwood and B. Matthews.

Patents Sealed.

1514. J. Banwell.
1516. J. Newnham.
1523. W. Naylor.
1524. J. A. Sparling.
1525. J. L. Ganne.
1536. H. A. Bonneville.
1545. D. D. Kyle.
1547. R. Brownlee.
1550. C. Peterson.
1562. E. Wilks.
1563. A. Twaddell.
1567. L. A. Majolier.
1568. W. Rowan.
1575. J. Murray.
1576. A. R. Stocker.
1580. T. F. Parsons.
1588. W. Toovey.
1592. E. Myers and W. R. Williams.
1603. W. Kirrage.
1605. H. C. Lee.
1608. A. Tulpin.
1609. W. Clark.
1614. T. Dunn.
1639. J. H. Johnson.
1654. W. E. Newton.
1659. H. S. Warner.
1663. J. McDonald.
1672. A. and B. S. Gower.
1680. G. C. Collyer.
1721. M. A. F. Mennons.
1734. M. W. Ruthven.
1802. J. H. Johnson.
2039. H. A. Bonneville.
2352. T. and W. Marshall.
2459. J. Gibson.
2472. A. V. Newton.
2477. G. Parry.
2549. E. H. C. Monckton.
2593. R. Baillie.
2661. J. Marshall.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, JANUARY 1, 1864. [No. 580. VOL. XII.

Announcements by the Council.

PRIZES TO ART-WORKMEN.

The works rewarded by the Society of Arts, and for which prizes have been given, have been placed, by permission of the Lords of the Committee of Council on Education, in the South Kensington Museum, and will be found in the Gallery of the Iron Museum, at the entrance to the Sheepshanks Gallery.

The Christmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of Institutions.

SOUTHERN COUNTIES ADULT EDUCATION SOCIETY.

The following paper, "On Agricultural Instruction on the Lower Platform," by W. Wallace Fyfe, Esq., of Charminster, Dorset, was read at the annual meeting of this Society, held at Devizes:—

In October, 1861, I had the honour of submitting to the Society at Dorchester, a new method of imparting Agricultural Science. That scheme, subsequently ventilated by the exhibition of my great sheet Farm Calendar and large type catechism, in the International Exhibition of 1862, and anxiously discussed, first before the Science Congress, in the Guildhall of London, and subsequently in the columns of the newspaper press, has been excepted to, because in the opinion of some we are not in a position to teach science to the unlettered mind. My present purpose, therefore, is to inquire what can be done on lower ground; for it is obvious that there is a great deal of common practical matter-of-fact information which, whether we choose to call it scientific or not, it would be advantageous to have communicated to the rural adult population in a methodical way, and in a satisfactory form; information which is in every way becoming more and more essential to their successful pursuit of their calling, but which it is left entirely to the chapter of accidents to supply them with. In a paper before the Social Science Congress in Edinburgh, I have endeavoured to illustrate the difference that is found to exist betwixt instruction formally and exhaustively conveyed to a man on any subject, however familiar, such as the common plough, and the imperfect, crude, and undigested notions he is likely to adopt, though founded on his own experience, when left to the untutored guidance of his own devices. Every man who can handle a plough is well enough aware, for instance, that it possesses working parts of different shapes, passing under different names, and serving different uses. Every skilled ploughman can doubtless take all these to pieces, and put them together again, judge when anything is amiss with them, and detect and remedy their common mechanical derangements. So in like manner he is well aware that the horses which draw his plough possess distinct and different parts, most of which he can, from long acquaintance, name familiarly, down to the hoofs, fetlocks, and pasterns, fore-arms, hocks, withers, and so forth. Now, suppose any of these men were to be brought up for competitive examination on the subject of the plough, before this Society's Examiners, should they at any future time decide on cultivating a little advanced and practical, as well as a great deal of elementary and literary knowledge, he would find that although the questions to be asked him were simply what he would esteem himself foolish not to know, he could not perhaps readily or perfectly answer them. Suppose it were put to him to say what are the twenty working parts of the improved solid or trussed beam plough? And what are those parts, their uses, and places in the composition of the instrument? I don't pretend to say that the man would be puzzled, because if you gave him time he might not, but I am perfectly sure he would be plucked on that examination, and my reason for thinking so is that the plough with all its complications (many of them modern) is clearly a study, and a proper subject for instruction. If such be the case with the plough, by far the most perfect implement of agriculture, yet one which, modified and improved as it may have been, never has, and never can have departed from its primitive simplicity of pushing the clod asunder, how much more must this necessity arise in regard to other agricultural machines and implements which we yet expect our common and unskilled labourers to approach and handle utterly devoid of initiation. Not only, however, in regard to machinery, but to every matter of importance in the rural economy is this observation capable of being applied. The weather, about which everybody knows all that can be known, is precisely one of those subjects on which our information has of recent date received the most marvellous extension and expansion. Forecasts of the weather are now made and applied with an intrepidity and success which would a few years ago have been pronounced impossible, or empirical. A degree of confidence is gained by the agriculturist in common with the navigator, in the regulation of his movements which he never possessed before; and this again illustrates the difference betwixt rational study and random observation. There is, in fact, no subject in the range of country occupations but is capable of being mastered in detail as completely as it now seems to be caught up by intuition; and surely if intelligible results such as those above alluded to are to proceed from the introduction of method into these matters, it is worth while considering whether a professional training of some kind cannot be imparted to the agricultural labourer. The mass of matter which is open to be dealt with either in night schools, where this idea might be adopted and engrafted on the other educational procedure, or in rural

clubs organised under competent auspices for mutual instruction, or by any of the means adopted in mechanics' institutes, is no doubt great, and its detail is various. I have been lately investigating, for example, the subject of farm seeds and seeding. I find that in the single article of seed wheat alone, there are seventy named varieties in common use in this country, possessing distinct shades of difference in shape, colour, and quality, earliness or lateness, productiveness, hardihood, and so forth; and that were a museum of such things formed in every rural district, for the purpose of familiarising cultivators, by means of actual study and example, with the properties and characteristics of all our cereals and other grains and products, there could not be conceived, perhaps, a more important advance in agricultural information. The same thing occurs to the mind and develops itself to the same extent, as regards the nature, varieties, and proper treatment of cattle, sheep, and horses; the operations in husbandry generally, the uses and values of manures and their application; the management of the dairy, the growth of wool, and the securing of crops. The proposition to give general, perhaps universal instruction, in place of chance and accidental skill on all such points to the husbandman, may be met with the objection, that although there are, or may be, experts, who could enlighten those around them on their particular specialities, the general and comprehensive scope of the instruction required altogether precludes the chance of finding instructors. If, however, it is once admitted that the peasant wants agricultural training of some kind, as much as the sailor wants to be taught how to splice a rope or rove his tackle, how to name his ropes and how to handle them, as much as any tradesman or operative has need to be instructed in his calling, we must cast about in order to do the best we can to supply that want. As I have already hinted, new schools or rural institutes might, by dint of organisation, be brought to supply this useful, practical, and available instruction. It must be owned that the best and most satisfactory means would be to provide trainers for the men out of the superior grades of their own order, and to have them properly and fittingly instructed themselves, so as to be able to direct and systematise the mastery of each successive department through which it may be found desirable for the men to pass. With moderate aims, and avoiding everything but practical objects, it does not seem as if the difficulties in the way of accomplishing this were at all insuperable. Many an employer would at this moment be glad of such a chance of putting his hands in the way of better qualifying themselves for the tasks they are called upon to perform, and the hands themselves would discover that a dignity would be added to their labour, in proportion as their intelligence was brought to bear upon it, as well as their physique. All that is now argued for, is some mode of teaching the agricultural labourer what he is about, what is the meaning of any operation in which he may be required to take a part, and how he may best and most satisfactorily perform it. There is no performance in which a skilled workman does not play a better part; and there is no reason for singling out agriculture from all other employments for the purpose of entrusting to unskilled labourers its complicated mechanism, its costly stimulants, its valuable live-stock, and the hopes and prospects of its inestimable produce. The interests staked in these incompetent hands are enormous—more than enough, at all events, to induce us to give a thought to the means of obviating so much that is amiss in all that relates to the rural mind and intelligence. But if something be not done, and that shortly, to supply instruction comformable to the rapid race of agricultural improvement, high farming must relapse into a theory, and practical agriculture become abortive, for want of labourers capable of carrying through the grand developments of the age This is no idle threat. I have known parts of the country where the superior system of farming could not be carried on, simply because the labouring people could not and would not comprehend or aid it; and nothing is more certain than that the rustic must be plainly but practically instructed in his business like the rest of mankind, and not left stationary whilst all else are moving.

The following paper, "On the Method of Establishing a Public Building for the Uses of various Institutions and Societies in Provincial Towns," by H. Thompson, Esq., Andover, was also read:—

Exactly six years since I had the honour of submitting to this Society, at their Conference at Basingstoke, a paper "On the Causes of Failure in Local Societies, &c., and Suggestions for obviating the same." I therein stated my presumption that failure arose from a want of united action and concentration in one locality. My paper went on to state how those difficulties might be met and overcome, how the result would be a general benefit, and the end costless. It is, therefore, with no little pleasure that I again venture to tax the time of your valuable Society by stating the method of an attempt to put this scheme into action, and the probability of success that may attend it.

Suitable premises being in the market, a scheme was put on foot to raise one thousand pounds in two hundred shares at £5 each, bearing interest at 3 per cent. per annum. Nine hundred pounds were raised, the highest shareholder embarking £50, and very many only £5. The premises were purchased at £900. The repairs, alterations, &c., will cost £100 more. It will, perhaps, be well (clearly to carry out the exemplification) to state the capital embarked at £1,000.

The premises having been so arranged as to admit of it, the room is thus appropriated. On the ground-floor is the depôt of the Society for Promoting Christian Knowledge, and the keeper's residence; on the first-floor the largest room is a library, containing the book-cases of the Institute, with nearly 2,000 volumes of standard works, the gatherings of many years. This room would accommodate thirty students. Two other rooms are appropriated as reading-rooms, and are equal to accommodating a like number. A room is rented as an office by her Majesty's Board of Inland Revenue, and beyond that there is a large room capable of being used as a lecture-room, or (as I hope) a museum. On the upper floor two large rooms are occupied by the School of Art, with accommodation for 40 pupils, one being appropriately lighted by a roof lantern, and there are two other rooms that can be used as class rooms. The other parts of the premises are let to tenants at rentals to be hereafter stated. I now come to the financial statement, premising that the shareholders having agreed to receive only 3 per cent. per annum in consideration of the object in view, all surplus (after payment of interest, rates, &c.), is to be appropriated by trust deed to the redemption of capital, so that eventually the building may become a free and unencumbered public institution, for the purposes to which it is now devoted.

The following statement of rents and outgoings will show whether the plan be feasible and financially secured, and they will show also, as I hope, that, after satisfying all claims, the end desired is likely to be attained:—

Income per Annum.

3 rooms, let as reading-room and library ...	£12	
1 ,, Society for the Promotion of Christian Knowledge, as Depôt	12	
2 ,, Government School of Art	12	
1 ,, Office of Inland Revenue	15	
Premises let as shop, &c.	25	
Stores	10	
		£86

Expenditure per Annum.

Rates, insurance, and repairs, say	£20	
Incidentals .... ,,	6	£26
		£60
Deduct 3 per cent. on £1,000		30
Annual surplus		£30

The rents allotted to the public institutions being reasonable, and the other premises letting readily at the sums set opposite to them, it is not too sanguine a hope that they may continue readily to pay these sums, and in that event the whole capital will be liquidated in twenty years, and the premises become a public institution, free and unencumbered.

Thus have I endeavoured to show how, by small means, united action, but, above all, patience and forbearance towards each other, large ends may result in such undertakings, and I add my fervent wish for the success of the effort that I have described.

MANCHESTER MECHANICS' INSTITUTION.—At a recent meeting of the Directors a resolution was unanimously adopted receiving with great regret the resignation by Mr. Edwin Simpson of the office of secretary, on his appointment to that of Master and Secretary of the Manchester Royal Exchange. The Directors record their entire satisfaction with the ability, judgment, and zeal with which Mr. Simpson has discharged his varied and important duties.

MARLBOROUGH READING AND MUTUAL IMPROVEMENT SOCIETY.—The nineteenth annual report, presented at Michaelmas last, notices its continued prosperity, the balance in the treasurer's hands being £39 18s. 4d., an increase of nearly £10 to that of last year. Additions have lately been made to the library to the extent of 50 volumes, at a cost of £12. In referring to the success of last season's lectures—in proof of which the Committee refer to the crowded state of the assembly room on several occasions—they express regret that a larger room is not available for such purposes. Among the lectures delivered or announced are "The Last Days of Eminent Men," by Dr. J. C. Daniel; "The Construction of the Animal Frame," by B. Waterhouse Hawkins, Esq.; "Ghosts and Apparitions," by Joseph Simpson, Esq.; "The Sea, a Highway, a Battle Field, and a Grave," by Allan Curr, Esq.; and "Ill-used Men," by George Dawson, Esq.

EDUCATION AND THE POLICE FORCE.

On Wednesday, the 23rd ult., Mr. Harry Chester addressed a large body of the Metropolitan Police, at Poplar, in explanation of the advantages derivable from the examinations of this Society and the Metropolitan Association for Promoting the Education of Adults. The meeting was held in the large school-room adjoining the police-station and opposite to the parish church of Poplar. Besides the Rev. T. Nowell, Rector of Poplar, and his curates, there was no one present but members of the force. The subject appeared to have excited considerable interest amongst them, as they mustered in large numbers, and kept dropping in, as they came off their beats, up to the very close of the address. Mr. Harry Chester explained that he had been invited by the Rector to address the Policeman's Mutual Improvement Class, which holds its meetings in the room in which they were then assembled. In addition to the usual explanations of the simple preparatory examinations held by the Metropolitan Association and its Local Boards, and the advanced examinations held by the Society of Arts itself, with their respective certificates and prizes, Mr. Chester pointed out how peculiarly important to a policeman were the advantages to be obtained from education. No one could enter the police force without being able at least to read and write. There was an excellent foundation, but only a foundation, for a really good education. Of two policemen having equal natural abilities, and equally good characters, but one improving, and the other neglecting to improve, his abilities by education, there could be no doubt that the former would be the happier man and the more useful and successful policeman. He would be better able than his comrade to understand what he saw, and to draw just inferences from it, to understand and obey his instructions, to appreciate and report facts with correctness, to give clear and accurate evidence, to stand the badgering of counsel without being confused, and he would have a much better chance of being employed in important matters, and of obtaining promotion. With a view to this promotion he ought to be always improving his education. That which sufficed for a constable would not suffice for a sergeant, nor would that which sufficed for a sergeant suffice for an inspector or a superintendent. There was a peculiarity in the case of policemen which they would do well to bear carefully in mind. In other services men commonly died in harness, and were very rarely able to put it off before they had attained to old age. But with this force it was just the reverse. After a comparatively short service every policeman with a good character was entitled to his discharge and a pension. What were they to do with their leisure? How were they to add by their own exertions to the amount of the pension, insufficient in itself to maintain them? Nothing was more wretched or more ruinous than leisure to an ignorant man, and there were few means of gaining a livelihood satisfactorily open to an ignorant ex-policeman. But a well-educated ex-policeman was quite a different being. To him leisure was a blessing, because he could well employ it, and there were abundant openings for him, with his good character, his understanding mind, his improved manner, and his partial pecuniary independence, to obtain employment in positions of trust and respectability. In conclusion, Mr. Chester stated that he was very glad to find that improvement classes, similar to that at Poplar, were spreading in all the divisions of the police of the metropolis, and he would with pleasure give similar explanations wherever they might be required.

Fine Arts.

SCHOOL OF FINE ARTS IN PARIS.—The Superior Council for Instruction, in connection with the Imperial and Special School for Fine Arts, the formation of which was prescribed by the 7th article of the decree of the 13th November, 1863, has just been constituted by his Excellency the Minister of the Emperor's household and of Fine Arts, as follows:—The Duc de Morny, Honorary President; the Superintendent of Fine Arts, President; the director of the administration of Fine Arts, Vice President; Messrs. Leon Cogniet, painter, member of the Institute; Muller, painter; Duret, sculptor, member of the Institute; Cavelier, sculptor; De Gisors, architect, member of the Institute; Lefuel, architect, member of the Institute; Forster, engraver, member of the Institute; Dumas, senator, member of the Institute; Mérimée, senator, member of the Institute; Noizer, General; Théophile Gautier, author.

DISTRIBUTION OF PRIZES TO THE EXHIBITORS OF THE "SOCIETE DES BEAUX-ARTS APPLIQUES A L'INDUSTRIE" AT PARIS.—The *Moniteur* gives a long account of this proceeding, of which the following is an abridgment:—This event took place on the 14th December, at the Palais des Champs Elysées, and was not only well attended by those to whom prizes were awarded, but also by those who came to applaud their more successful opponents. The ceremony was held in one of the large cross galleries on the first floor of the palace. Arrangements, which were elegant without being superfluous, had been made to receive the president, vice-president, members of the committee of organisation, as well as for a choir composed of Orpheonists, under the superintendence of M. Armand Cheve. At eleven, the reserved seats were full. At twelve a.m. the president, M. le Baron Taylor; the vice-president, M. Tresca; M. Guichard, M. Cardaillhac, and M. Julien arrived. M. Guichard then proceeded to deliver a speech. Having briefly alluded to the medals presented by the Emperor and Empress, he proceeded to explain how this exhibition should not be confounded

with the industrial exhibitions hitherto held. The juries of the latter were pre-occupied with numerous important considerations, entirely independent of art. Beauty of form, happy harmony of colour, clever execution—in fact, art, was shown by him to be the data on which the jurors of this exhibition based their verdict. He then explained how, for this reason, several exhibitors had been denied the right of competition. M. Guichard terminated his speech with an announcement of the financial results. The receipts amounted to 77,000fr.; the expenses were about 45,000fr.; and a fund, founded by Baron Taylor, for the assistance of inventors and industrial artists, was about 32,000fr. M. Guichard's address was followed by one from M. Tresca, of which the following is the substance:—This second exhibition is larger than the first, but represents but poorly the industrial art of France. The jury is divided into several sections, each of which presents a report. The section for Painting have most particularly accepted the task of appreciating original works, due either to the pencils or to the brushes of our industrial artists. This appreciation has been made felt in M. Barty's report, with a taste which cannot but be appreciated by all, when the reports shall have been distributed. The section for Engraving have included under their task the necessity of examining every species of reproduction, whether by lithography or photography. Our engravers on wood have no further cause to be envious of foreigners. Our litho-chromes and printings in colour hold good comparison with those of England. M. Rohault de Fleury has preceded his report on sculpture by an attempt to re-establish the true rules of good taste, and by warning artists against a too great abundance and richness in details. Our celebrated bronzes have called forth the especial attention of this section. The jury for Ceramic Art have signalled the truly marvellous progress which has been realised lately. The celebrated Minton has shown in England the influence which an energetic man can exercise on industry, when he knows how to ally technical knowledge with taste for form. Minton has caused a revolution in English pottery, and thus it is that our French artists enviously follow on his track. Messrs. Kastner and Bouillon have examined the musical instruments. It is, perhaps, for the first time, that the elegance and musical qualities of each instrument have received the same and equal care. Drawing schools have been invited to take part in the exhibition; 52 schools have done so. The necessity of weighing the merits both of master and pupil has imposed on the jurors the obligation to carry their investigation as far as possible. The exhibition of arts applied to industry satisfies that desire, which founded the South Kensington Museum, which opened the Congresses at Brussels, which put the Campana Museum in our possession, and which daily increases the appreciation of the riches of the Hotel Cluny. Our exhibition is, perhaps, the modest standard of this era of science and reason, and it should express the state of artistic production at this time. At the conclusion of M. Tresca's address, M. le Baron Taylor rose amidst the warmest applause. He reverted in general terms to the flourishing condition of these exhibitions, and to their gradual improvement. "Never forget," he said, "that the study of the highest art should always be your guide, and the predominating cause of your success." He assured the exhibitors that encouragement and reward would never be wanting on the part of the Emperor, or of his minister of commerce and public works. The proceedings terminated with M. Tresca's proclamation of the list of successful exhibitors; and after the excellent execution of a cantata, composed expressly for the occasion, the assembled multitude separated.

Exhibition of the Works of Mr. Mulready, R.A.—The following minute has been passed by the Committee of Council on Education; and Mr. Sketchley, late Superintendent of the Picture Department of the Exhibition of 1862, and Secretary of Commission on the Royal Academy, has been charged with the executive duties for carrying it into effect:—"My lords observe with regret the death of Mr. Mulready, the Royal Academician. In 1848 the Society of Arts formed an interesting exhibition of Mr. Mulready's works executed up to that time. Since then his works, and especially his life studies, have largely increased. Through the liberality of Mr. Sheepshanks, the Science and Art Department possesses numerous specimens of Mr. Mulready's art of all periods, and a series of his studies of the human figure has been acquired for the use of the schools, and circulated among them. Their lordships propose to form another and complete exhibition of Mr. Mulready's works, to comprehend as far as practicable all his oil and water colour paintings, and drawings, which, extending over a practise exceeding half a century in duration, would be of great service to art students in showing his various methods of patient study. Their lordships will accordingly invite the assistance of the proprietors of Mr. Mulready's works in the proposed exhibition. The exhibition will take place in the South Kensington Museum, in the spring of 1864."—Henry Cole, Secretary.

Manufactures.

ON JAPANESE PAPER.

By P. L. Simmonds.

Extensively as paper is employed in Japan, we are not yet thoroughly informed as to the materials of which it is manufactured. A large portion is, we know, made from a species of mulberry, to which Von Siebold has given the name of *Broussonetia Kaminoki*. Whether this is a distinct species from the *Broussonetia papyrifera*, the bark of which is used for making paper in China, or only a variety, is not yet clear. Some young trees of the Japan mulberry are, however, said to have been introduced recently into France in the gardens of the Acclimatisation Society. The tree might be grown in various parts of Europe and America, if the culture were remunerative enough in the yield of bark. It prefers a strong soil, especially of a calcareous nature, and should be planted at intervals not exceeding three feet; otherwise the branches would extend, whereby the bark would become full of knots, causing much loss of substance in the manufacture. The soil is not manured until the second year; in the autumn of that year the plant is lopped close to the root; and this operation, as well as that of manuring slightly, is repeated every second year. 100lb. of branches thus obtained, stripped of their leaves, yield 10lb. of bark. The branches, on arriving at the manufactory, are put into hot water for half an hour; the bark can then be easily stripped off by the hands, and is afterwards left in the sun to dry. It is next macerated for three days in river water and bleached in the sun. These operations having been several times repeated, the bark is at last boiled in a lye of ashes for the space of three hours, then manipulated for some time to separate any epidermis that may have remained; and lastly, when dry, the mass is pounded fine and made into a pulp with water, to which a glutinous liquid extracted from a shrub called Nebooicko—probably the *Acacia Nemu*—is added in the proportion of about two pints per cwt. of pulp. The latter is then made into sheets much in the usual way. Sir Rutherford Alcock states that the barks of different shrubs are used, and his collection in the International Exhibition of 1862 contained some 60 or 70 kinds of paper, with the various applications for pocket-handkerchiefs, bank-notes, printing and room-paper, waterproof clothing, imitation leather, &c.

In Kœmpfer's "Amænitates exoticæ," there is an account of the mode of preparing Japanese paper which very much resembles the Chinese. The plants used for the purpose are there called *Kaadsi*. The botanical description of Kœmpfer, is *Papyrus fructi mori celsæ, sive morus*

sativa, foliis urticæ mortuæ, cortice papyrifera. According to this description the plant cannot be other than the paper mulberry tree, which, as already remarked, is very like the *ku-chu* of the Chinese.

Every year, after the fall of the leaves, the young shoots, already rather thick, are cut off in lengths of three to four feet, and made up into bundles in order to be boiled in soda ash. They are tied together and placed upright in a very large and closely covered vessel. The boiling is carried on until the bark loosens and the wood is left bare. It is then allowed to cool, and the wood split, in order to remove the whole of the bark, which is then put into water for three to four hours. When the bark is sufficiently tender, the black skin is scraped off, and at the same time the annual bark is separated from the bark of those branches which are not yet so old. The youngest bark gives the finest and best paper. That made from the older bark is blackish but not unpleasant. Bark more than a year old must be thrown aside, as it yields a very coarse paper. Parts which are knotty, thick, and otherwise faulty, are also picked out and very ordinary paper made therefrom.

When the bark is duly arranged according to its different qualities, it is boiled in ley, and during the boiling stirred with a thick rod, occasionally adding fresh ley to prevent its boiling over, and to replace the loss by evaporation. The bark is allowed to boil until it can be rubbed to pieces between the fingers, and forms a paste. To make the ley, two pieces of timber are set crosswise on a tub and covered with straw, upon which are placed wood-ashes, over which boiling water is poured.

The bark after boiling, is taken out of the vessel and washed. This washing is a delicate operation, as it must not be carried too far. If the stuff be only slightly washed, the paper is strong and firm, but coarse, and of little value; if it be too much washed, the paper is beautifully white, but weak, runs, and is useless for writing. Experience only teaches how the washing is to be done, which must be in running water. The stuff is thrown into a strong basket, through which the water only can pass, and continually agitated until it is sufficiently pure.

To make fine paper the stuff is washed twice, but in a cloth instead of a basket, for the more it is washed the more the bark disunites, and the greater the loss. In the process of washing, the knots and other extraneous substances are, as much as possible, removed.

When the stuff is sufficiently washed it is thrown on a strong, smooth wooden table, and beaten by two or three men with sticks, and a hard wooden implement called "kusnocki," until it is as clean as paper. It is now put in water and stirred until it forms a paste. The paste is washed in a tub, into which is then poured a slimy and glutinous fluid, prepared by steeping rice and the root *Oreni* in water. The mixture is stirred with a rod until the three substances are well mixed, and form a liquid and uniform paste. The sheets are then made on forms, which consist of rushes. Nothing now remains but to dry the paper. The sheets are laid on a table covered with a mat, and between each sheet there is placed a board called kama-kura, that is, cushion. This board, somewhat larger than the sheet, is of use to remove the sheet subsequently. Each heap is also covered with a mat, upon which a board is laid, and gradually a heavier weight, in order to press out the water. The next day the weight is removed, and one sheet after another lifted with a rod and placed on a thin board, to which it is made to adhere by hand, and then placed in the sun. The thoroughly dried sheets are collected, cut, and taken to the warehouse.

The steeping in rice-water makes the paper white and strong. This is prepared in a glazed earthern pot, in which the grains of rice are soaked in water. The pot is at first slowly shaken, afterwards more quickly, then cold water is added, and the whole strained through a cloth. The remaining rice is put in fresh water, and the process repeated so long as the rice gives a glutinous matter. Japan rice is excellent for this purpose, as it is the whitest and most glutinous of Asia.

The liquid from *Oreni* is prepared by putting the cut and bruised root in water. In twelve hours the water is glutinous. According to the season of the year more or less of this liquid is used, and the whole art of making good paper depends upon the quantity of *Oreni* used.

The coarse paper for packing purposes is prepared in the same way from the bark of the shrub *Kadse-kadsura.*

Japan paper is strong, made in large sheets, and so much like linen that it may be mistaken for it.

Dr. Hawk describes the process much in the same manner. In December, he says, after the tree has shed its leaves, they cut off the branches about three feet in length, and tie them in bundles. They are then boiled in a lye of ashes in a covered kettle, till the bark is so shrunk that half an inch of the wood may be seen projecting at either end of the branch. When they have become cool, the bark is stripped and soaked in water three or four times, until it is soft, when the fine black skin is scraped off with a knife. The coarse bark is then separated from the fine; that from the young branches makes the finest paper. The bark is boiled again in fresh ley, continually stirred with a stick, and fresh water from time to time added. It is then put into a sieve and taken to a brook, and here the bark is incessantly stirred till it becomes a pure pulp. It is now thrown into water, and separates in the form of meal. This is put into a small vessel with a decoction of rice and a species of *Hibiscus,* and stirred until it has attained a tolerable consistence. It is then poured into a large vessel, from whence it is taken out and put in the form of sheets on mats or layers of grass straw; these sheets are laid one upon another with straw between, and pressed to force the water out. After this they are spread upon boards in the sun, dried, cut, and gathered into bundles for sale. This paper will better endure folding and last longer than ours.

ALKALI WORKS.—The Act for the condensation of muriatic acid gas in alkali works, which was passed last session, comes into operation this day (Jan. 1st). The condensation must be effected to the satisfaction of Inspectors appointed by the Board of Trade, and if 95 per cent., at least, of the muriatic acid gas evolved is not condensed, the owner of the works is liable to a penalty not exceeding £50 for the first offence, and £100 for the second offence. The owner is liable in the first instance, unless he can show that the offence has been committed by some agent without his knowledge, in which case the agent. is liable. Alkali works must be registered.

ROSE CULTURE IN TURKEY.—M. B. J. Dufour has published, in the *Bulletin de la Société Imperial d'Acclimatation* of Paris, an interesting paper on the natural productions of Turkey, in which he speaks of the rose, cultivated there for its essence, forming an important article of commerce in the east. The rose is specially cultivated in Roumelia, in the district of Philippoli, the inhabitants of which country he describes as more advanced in agriculture than those of other parts of the empire, and as giving special attention to that species of the plant, the essence of which is justly considered by all perfumers as the best of all, though they very often substitute for it in their preparations other essences, such as that of the geranium, which has a considerable analogy to it. The essence is manufactured by the growers of the plant, who use a still for the purpose, like that used in distilling spirits. The distillation is thus carried on. From the 20th to the 25th of May, the period of the annual rose harvest, the country people gather the rose leaves before sunrise, and these they distil in portions of from 8 to 10 okes* mixed with from 10 to 15 okes of pure water, and this goes on without interruption for two hours, after which time the roses are withdrawn. They then distil afresh the rose water thus produced, and afterwards skim with a spoon the essence of roses which floats on the surface. The annual harvest of this species of rose

* An oke is 15 drachms.

amounts to 3,600,000 okes, and the production of essence of roses varies from 200 to 400 thousand meticals,* depending on the meteorological state of the air, which has an important influence on both operations, which extend over a period of about 25 days. The most favourable temperature for gathering the roses, and which is equally important for the production of the essence, is a fresh and almost cold temperature, from 10 to 12 degrees of Réaumur. For example, with a low temperature, accompanied with fog and fine rain for three days, (and this often happens in that country,) 400 roses will weigh one oke, and with eight okes of these roses one metical, or a drachm and a half of essence is obtained, whereas with a higher temperature it takes 1,000 roses to make one oke, and 20 of these okes to produce one metical of essence. But nevertheless even this last proportion is still greater than that which the distillation of roses in Provence gives, for there it is stated to be necessary to employ sixty okes of roses to obtain one metical of essence. M. Dufour calls the attention of the French distillers to this point, considering that, taking good and bad years together, only 12 okes of roses are required to produce one metical of essence, bringing the production up 300,000 meticals. He describes the rose as bearing from 20 to 25 petals, of a brilliant hue and very bitter taste, which, when beaten with sugar, form a paste having the properties of scammony. The plant which produces this rose rises to about 1 metre or 1·30 metre in height, and flourishes vigorously in a clayey soil, which it is necessary to turn over four or five times a year. The quality of the roses, and consequently that of the essence, varies with the nature of the soil. The perfume differs according to the soil, as is proved by the fact that the agents readily distinguish the difference in the smell, and, what is more, the essence of one village freezes at 15 degrees of Réaumur, whilst that of another scarcely freezes at 5 degrees. Although the general production of roses during the last few years has tended to decrease, by reason of the low price, which has gone down from 1,250 fr. to 850 fr. the kilo., a price which gives a less profit than that afforded by the culture of cereals, yet the value of this material amounts annually to a million of francs at the least. There is also another species of rose cultivated in Turkey, from which the sweetmeats which ladies in the East offer to their visitors are prepared.

Colonies.

ON THE INFLUENCE OF MEGASS ON ANIMAL DECOMPOSITION.

By Henry Gibbs Dalton, M.D., Georgetown, Demerara.

I have noticed some particulars attending animal decomposition when subjected to the influence of megass, or the dried stem of the sugar cane after the saccharine juice has been crushed out by machinery. But before entering upon the circumstances which first led me to consider this subject, it may be as well to state that the sugar cane, which is sufficiently known to render any description of it quite unnecessary, after having been crushed by massive iron rollers worked by steam power, is stacked under large sheds open at the sides, but protected by slated or wooden roofs, where it is kept until sufficiently dried to be used as fuel for the boilers. When first stacked, it is known as green megass, being then in a more or less fresh state, and emits a powerful sweetish odour, and is evidently the resort of millions of small gnats and other minute insects, for towards morning and evening the Megass logies, as they are called, are surrounded by swarms of swallows and other birds which evidently come here to obtain a bountiful repast.

But in this raw or green state there exists another striking and peculiar condition; there is an enormous amount of heat developed, causing the hands if thrust in to be quickly withdrawn, and a certain amount of steam or vapour is noticed. Both in this state and when more completely dessicated, megass is very combustible, and fires, spontaneous or accidental, frequently occur in these logies. It has often occurred to me to think that certain gases are generated during these changes, which probably tend to explain some of the peculiar facts about to be noticed.

On the 31st January, 1863, I was summoned to attend a coroner's inquest, and examine a dead body found in one of the megass logies on an estate on the west bank of the river Demerara. On approaching the spot where the corpse was stated to be, there was no fœtid odour as usual to indicate its presence, and on climbing up the dried megass, I saw the corpse of a human being partially embedded in megass, but without odour, and in a completely mummified condition. There was a fold of cloth twisted round the neck, and this joined another fold attached to a beam close by, leading one to suppose that death had occurred from strangulation. The body was completely dessicated, shrivelled and brittle, so much so that on trying to draw the corpse towards me by means of a pick for the purpose of examination, I was surprised to find the head separate completely from the trunk. On more closely examining the body the following facts were noticed:—

There was not the usual odour of a body long since lifeless, and exposed to the action of the air in a tropical climate.

The muscles, soft parts, and internal organs were shrivelled, dry and parchment-like in character.

The sex (male) barely distinguishable; the lower limbs were bent at an obtuse angle, and the skin and muscles clung round the bones like paper stretched over boards; the skull and face were denuded of all muscular and ligamentous traces, so that the disarticulation of the lower maxilla and cervical vertebræ was complete.

By the shaven crown and tuft of long hair, I recognised the body to be Chinese, and the only identity as to name, &c., arose from the peculiarities of the teeth, and from the absence of certain of them, which enabled some of the other Chinese immigrants to conclude that the deceased was one of their countrymen, who had been missing from the estates for several weeks.

This body, then, had been lying loosely covered with megass in the place where it was found for probably several weeks, during which time, although labourers were constantly in the neighbourhood, it had attracted no notice by any noxious effluvia, nor was it even spied out or scented by the carrion vultures (*Cathartes Jota*), who seldom fail to detect dead carcases of any description, however obscured in the mud or the tangled bush of this colony.

Struck with so singular an appearance and condition, and with the remarkable absence of noxious smell, it seemed to me to be the result of some influence exercised by the megass on which the body had fallen or been thrown, and with a view to elucidate this, I instituted the following experiments:—

1st. On the 1st April, 1863, I buried a dead goat loosely in megass, and visited the spot on the 3rd, but could only detect a faint odour of decomposition, quite unlike the intolerable stench which is so common here in dead bodies exposed to the sun and air. On repeating my visit a few days afterwards, I found that the dead goat had disappeared, and on inquiry, found that it had been stolen by some Chinese who had speedily devoured it, so that it could not have been very offensive, for although our celestial immigrants are incorrigible thieves, and not very particular as to the quality and condition of their food, they would hardly have appropriated this first subject of my experiment had it not been more or less preserved by the agency of megass.

On the 27th of the same month I buried another dead goat in a similar manner, but somewhat more securely out

* A metical (called in Turkey "myscal") is about one drachm and a half.

of reach of the Chinese, and disinterred it about 30 days after, or on the 27th May. During that time I had repeatedly visited the neighbourhood, accompanied by others, and not one of us could detect the slightest offensive odour. On examining the body, which by-the-bye was completely disintegrated, there was no other trace of noxious effluvia than is peculiar to the dried skin of an animal. The head was denuded of all muscular and ligamentous attachments. The orbits were empty, and the bones forming it perfectly clean, likewise the nasal structure, palate, and jawbones. Several disarticulated vertebræ were found loose and totally void of muscles and ligaments, likewise the ribs and other parts of the body as far as they could be gathered; the outer casing of one horn was completely detached from its osseous support, and the rest of the carcase was in a fragmentary state, dry and scentless. There were no ants or other insects visible to account for this complete disintegration, but possibly whilst the noxious odour of decomposition was neutralised by the heat or gases developed by the megass, the work of destruction of the soft parts might have been carried on during the month of interment by ants and other insects, although no trace of them was visible at the time of my inspection.

Of the many practical advantages to which the discovery of the disinfecting properties of megass, if confirmed by further experience, might apply, I do not think I need offer any remarks at present, or until the subject has been more fully examined. I may mention, however, that an occasion lately presented itself by which I was enabled to test its value, and to prove its efficacy as a very useful agent in a sanitary point of view.

Shortly after my experiments on the properties of the megass, I was much concerned at the outbreak of a number of cases of sloughing ulcers on the feet and legs of the East Indian immigrants (Coolies and Chinese,) in one of the Estates' Hospitals under my medical charge, and my anxiety was still further increased on the appearance of hospital gangrene among some of the worst cases. Not only in the wards where the unfortunate patients slept, but throughout the whole hospital, the effluvium was most offensive aud disagreeable. After making use of several medical disinfectants in vain, I determined to make a trial of the megass.

I desired several large baskets to be filled with it, and placed them in the corners of the wards by the doorways, and in the gallery to windward of the rooms, and on my next visit was agreeably surprised to find the obnoxious odours greatly lessened. I continued its use, and in a short time (two or three days) the change for the better was very remarkable. Except in the immediate neighbourhood of the worst cases, there was no unpleasant odour, and even then the disagreeable smell was greatly modified.

Unfortunately there was no corresponding improvement in the character of the sores decidedly attacked by gangrene, but the general improvement in the hospital was manifest, for not only was the unhealthy effluvium neutralised by the megass vapour, but the peculiar, pleasant, and sweet flavour of the cane, was disseminated through the whole hospital, rendering its atmosphere fresh and agreeable, so much so, that in spite of the disappearance of the gangrene, and the existence merely of ulcers of an ordinary kind, its use and benefit are still appreciated by the nurses and patients, who are assiduous in constantly keeping up a fresh supply.

In submitting these few remarks on a subject altogether new, I think I may venture to state that in green megass we possess an agent competent materially, if not entirely, to neutralise noxious gases, and thus by arresting or destroying the offensive odours of animal decomposition, and the foul air of hospitals, to prove of eminent service and benefit in a tropical country, where these unpleasant and injurious conditions are too apt to prevail.

Obituary.

WILLIAM MAKEPEACE THACKERAY.—On the night of the 24th of December this great artist, after a short illness, was found dead in his bed, in his house on Kensington-palace-green. He was the son of an officer in the East India Company's Civil Service, and was born at Calcutta in 1811. He was educated at the Charterhouse, and resided for some time at Cambridge as a member of the University. Thackeray became celebrated, wherever the English tongue is spoken, as a writer in the best style, but he had the genius in him which might have made him equally great as a painter. Indeed, his first serious commencement to earn his living, was in the practice of the fine arts and not of letters, and he retained the instinct for drawing all his life. He studied for a time in Rome and Paris. You felt that his sketches, although verging on caricatures, were full of genius. Like Blake's drawings, although altogether deficient in cultivation and art power, they were worth a great deal more than many works where the art was pre-eminent. The illustrations of his "Comic Tales and Sketches," published in 1841, "Vanity Fair," and "Pendennis," were drawn and etched by himself, but in the "Newcomes," and "Philip," and the "Virginians," he made simply the pencil sketches, and put the etching of the "Newcomes" into the hands of Richard Doyle, and "Philip," and the "Virginians" were consigned to Mr. Watson. The result was not a very happy one in the Doyle translations, and Thackeray's own work, with all its rawness and awkwardness, was preferable. The proprietors of *Punch* might make an interesting sheet or two out of the vignettes and initials which his fancy inserted in his "Snob Papers," &c. Before Ruskin had aroused public attention to art criticism, Thackeray was in the habit of contributing to *Fraser's Magazine* an annual criticism on the Royal Academy and the exhibitions of the season. He had a keen feeling for excellence in art. Leslie, for some qualities, and Mulready for others, were greatly appreciated by him. Many years ago he wrote an admirable article in the *Westminster Review* upon George Cruikshank, and Cruikshank's etchings for the *Comic Almanack* were usually accompanied with a tale by Thackeray. "Stubb's Calendar, or the Fatal Boots," in 1839, and "Barber Cox, and the Cutting of his Comb," in 1840, were two of such tales. The causes of his death are accurately described in the *Times* of the 25th December. The accounts which have appeared in most other papers are erroneous. For many years past he was subjected to the most violent fits of retching, which occurred about every six weeks; they used to leave him so prostrated that he appeared almost lifeless afterwards. It was one of these attacks in its severest form, terminating with an effusion upon the brain, which caused his death. The *post-mortem* examination, which was conducted by his usual medical attendants, Mr. Haden and Mr. Traer, in concert with Mr. Henry Thompson, showed that besides the pressure on the brain the heart was overcharged with blood. The brain itself was found to weigh 58·5 ozs. Within the last three years Thackeray had invested a large portion of the fruits of his work—and very hard work too—in building a house on Palace-green, Kensington, somewhat in the style of Queen Anne's time, and he delighted himself in furnishing it with objects illustrating that period. It is a red brick house, very unlike a London mansion, immediately opposite the little gate entering Kensington Gardens. This, with the whole of his other property, devolves on his two daughters. He was buried at Kensal Green on Wednesday last. Only four of his relatives attended the funeral, which was of the simplest character, but a large concourse of his friends and admirers stood around his grave. His age was fifty-two years.

SAMUEL HALL, well-known in the manufacturing and engineering world for his numerous inventions, died on the 21st of November, 1863, at his residence Morgan-street, Tredegar-square, Bow-road, at the ad

vanced age of 82. He was the second son of Mr. Robert Hall, of Basford, near Nottingham, a cotton spinner and bleacher, still remembered there for his ingenuity and the singular beauty of his character. Robert Hall, as a cotton spinner, followed in the track of Arkwright and Peel, and as a bleacher he had the merit of first using chlorine, then called oxymuriatic acid gas, on a large scale, by which a result was accomplished in a few hours that had formerly required as many weeks to produce. He had great inventive talent, and was ever engaged in trying some new application of science to the improvement of manufactures. His neighbours designated the place where he first made his attempts to introduce the use of chlorine by the name of Bedlam, which it still retains. Berthollet had discovered that chlorine possessed the property of discharging all vegetable colours, and Mr. Hall corresponded with Dr. Priestley and Mr. Henry, of Manchester, on the probability of the successful application of this agent to the important art of bleaching. Dr. Priestley, in a letter to him, dated August 12, 1788, says:—

"Anything I know is at your service, but I really have nothing to communicate on the subject of bleaching by the dephlogisticated marine acid. I have indeed made the liquor in a small quantity for the purpose of taking spots out of linen, but I cannot think it will ever be so *cheap* a process as to serve for bleaching in large works."

He was at first discouraged from proceeding, but, recurring to the project, he experimented with the happiest results, and thus commenced a vast industry, the importance of which is described as follows by Baron Liebig (Letters on Chemistry, 3rd ed., p. 144):—" But for this new bleaching process, it would scarcely have been possible for the cotton manufacture of Great Britain to have attained its present enormous extent; it could not have competed in prices with France and Germany. In the old process of bleaching, every piece must be exposed to the air during several weeks in summer, and kept continually moist by manual labour. For this purpose, meadow land, eligibly situated, was essential. Now, a single establishment near Glasgow bleaches nearly 1,400 pieces daily throughout the year. What an enormous capital would be required to purchase land for this purpose! How greatly would it increase the cost of bleaching to pay interest on this capital, or to hire so much land in England! This expense would scarcely have been felt in Germany. Besides the diminished expense, the cotton stuffs bleached with chlorine suffer less in the hands of skilful workmen than those bleached in the sun." Mr. Hall was well versed in the chemistry of that day, as propounded by Black, Scheele, Lavoisier, and Berthollet, and was a constant reader of the well-known *Nicholson's Journal*, and the "*Annales de Chimie*." He was also well versed in mechanics, and, in 1794, received a prize of forty guineas from the Society of Arts for an improvement in cranes.* Mr. Hall's originality and powers of research were worthily perpetuated in his family. The fourth son, Dr. Marshall Hall, was known throughout the world, as a most distinguished physiologist and physician; and of the second son, Samuel, the subject of the present notice, it may be said that, in his genius for inventions, at once the result of science and source of improvements in British manufactures, and the extension of British commerce, he has rarely been excelled. To him Nottingham owes, in a great measure, its present commercial prosperity and importance, arising from his invention of the process of gassing lace and of the bleaching of starch, by which the Nottingham cotton fabrics are scarcely distinguishable from the linen thread lace of the Continent. Mr. Felkin, in a paper " On the History and present state of the Machine-wrought Lace Trade," read before this Society on the 28th of May, 1856, says:—

"It had been observed by Mr. Samuel Hall, of Basford, Notts., to whom not only this but other trades are deeply indebted for his scientific improvements, that both cotton yarns and fabrics, especially lace nets, were fibrous, and the interstices not clear. He patented inventions for passing both thread and nets, or other substances, through gas or other flame, and thus singeing off the fibre without injury to the articles, thereby effecting a great improvement in them. Mr. Hall's improved starch is well known. He was the first, so far as I know, who availed himself of extended advertising to get an invention or article into demand. His specimens of gassed thread and lace fairly placed beside ungassed ones, will be remembered as being found in every number of several periodicals for years together. He effectually made Urlings (*i.e.* bobbin) net known far and wide."

The first idea of passing a piece of the finest lace over an actual flame of gas was a bold one, and presents an instance of the most original imagination; for it was difficult to suppose that the whole fabric would not be consumed. Sir Humphrey Davy had just presented his paper on flame to the Royal Society. Mr. S. Hall was well imbued with the chemical science of that day, and it was plain to him, that by merely passing the lace over a flame of gas, the loose fibres might be removed from the lace, whilst the lace itself would remain unharmed. His inventive genius further suggested that the flame might be drawn through the lace, and that the desired result would be accomplished by means of a vacuum above the lace. Perfect success followed the trial. The sheet of lace passed to the flame opaque and obscured by loose fibre, and issued from it bright and clear, and not to be distinguished from lace made of the purest linen thread. In 1827 the late Lord Tenterden sat as judge at the assizes at Nottingham, and having previously presided on the occasion of a trial relative to the patent for this invention, expressed a wish to see the process which had so deeply interested him, and he visited the works at Basford. The principle was also applied by the inventor to cotton yarn itself, muslin and calico. The influence of this improvement on the British commerce in cotton goods has been immense, and its benefits have been largely shared by Nottingham, Derby, Leicester, Manchester, and Glasgow. But Mr. Hall's labours did not end here. The lace manufacturers of Nottingham complained that though their lace was clear, and perfectly white when bleached, its colour was greatly injured by the starch with which it was afterwards " got up." Mr. S. Hall extended to starch the principles which his father had applied to the bleaching of fabrics, and by the use of chlorine gave the manufacturers a bleached starch which at once perfectly remedied the evil. Among Mr. S. Hall's numerous inventions, may be noticed one by which he long succeeded above all others in the cultivation of the vine. Formerly the branches only were exposed to warmth; the roots being left in the cold soil. It first occurred to Mr. Hall to heat the roots like the branches. Formerly, too, the air of the hot-house, whilst raised in temperature, became proportionately dry; he proposed to supply it with moisture as well as heat. Both these objects were accomplished by means of steam diffused in the air and in the soil. The wood and the fruit were equally improved by this simple means. These and other experiments were devised at Basford Hall, then his property, where he exercised a graceful hospitality still well remembered. A crowd of new and brilliant ideas, however, soon distracted his attention, and it is to be regretted that he could not confine himself to the profitable working out of one alone. He had also in after years to contend with much injustice in connection with his engineering patents, and thus experienced the too frequent fate of inventors, who, as is well known, are seldom enriched by their schemes. The era of railways and steam ships was now commencing, and Mr. S. Hall accordingly turned his energies in this direction, obtaining patents, among others, for Improvements in the Steam Engine, for Combustion of Smoke, for the Prevention of the Explosion of Steam Boilers, and for the Reefing and Unreefing of Paddle-wheels. His principal improvements in the steam engine consisted in a new mode of condensation of the

* See "Transactions of the Society of Arts," vol. xii., p. 283.

steam, by passing it through metallic pipes or channels surrounded with cold water. A saving of more than 20 per cent. in fuel and repairs was reported to the Admiralty as being thereby effected. This principle of surface condensation is now in general use, and to it a large share of the increased efficiency of our marine engines is due. The combustion of smoke was produced by arrangements for slowly and gradually feeding the fire with fuel, and for the admission of atmospheric air to the ascending gases and smoke. An apparatus on Hall's principle is said to be now in constant operation at the General Post-office, in London. The prevention of explosion in steam boilers is effected by arrangements for giving a constant rotary movement to the valves, so that they cannot become immoveable and "fast," and for supplying the constant waste of water in the boiler, so that it can never become empty, or nearly empty. Lastly, the reefing and unreefing of paddle-wheels were effected without stopping the engine, or vessel, by means at once simple and effective. On these and kindred subjects Mr. Samuel Hall laboured and thought with extraordinary enthusiasm and devoted constancy to the extreme close of his protracted life. He had in large measure the true genius of the mechanician, and belonged by nature to that illustrious race which has in all ages bequeathed a heritage of power, and to which the world looks for its most splendid triumphs. He had no sooner invented one thing than he turned his active mind to another, leaving it to others to reap the pecuniary benefit of his invention; he thus made many rich whilst he remained poor. He spent immense sums on his inventions and never saved money for himself.

John Henry Green, F.R.S., died at his residence, Hadley, near Barnet, on Sunday evening, the 13th Dec. He was an only child, of wealthy parents, and having received a liberal education, and studied for some time at Berlin, pursued his professional studies at St. Thomas's Hospital, under the auspices of his paternal uncle, Mr. Cline. He was admitted a member of the Royal College of Surgeons on the 1st of December, 1815, having for two years previously acted as demonstrator, the best proof of his proficiency as an anatomist, and so creditably were the duties attached to this office performed, that, in 1818, he joined Mr. (after Sir) Astley Cooper as joint lecturer on anatomy and physiology. In 1820 he succeeded the younger Cline as surgeon to St. Thomas's Hospital, and with Sir Astley Cooper delivered lectures on surgery and pathology. As an operative surgeon he was unequalled in the skill with which he performed the operation for lithotomy, having, in 1847, operated in forty cases, and lost only one. This unequalled success created a great sensation at the time. In 1830 he was appointed to the professorship of surgery in King's College, of which institution he was at the time of his death a member of council. In 1835, on the death of Mr. Lynn, surgeon to the Westminster Hospital, and a councillor of the college, Mr. Green was unanimously elected to the chair in the council of that college, of which he had become so bright a member. In 1840 he was deputed to deliver the annual oration in memory of John Hunter, which, at the earnest request of his colleagues, he afterwards published, under the title of "Vital Dynamics;" and again, in 1847, he became Hunterian orator, and published the lecture under the name of "Mental Dynamics." In 1846, on the resignation of Sir Benjamin Brodie, Bart., Mr. Green became a member of the Court of Examiners, an appointment he held up to the time of his decease, and in 1849 obtained at the hands of his colleagues the highest appointment they had it in their power to confer—viz., the president's chair, an honour again conferred on him in 1858. From her Majesty's Government he received the appointment of President of the Council of Medical Education and Registration of the United Kingdom. The death of Mr. Green, though at last sudden, was not altogether unexpected; he had been labouring for some months under a sharp attack of gout, complicated with disease of the heart, from which it was hoped, by the kind skilful treatment of Mr. Brinton, his attached friend and physician, he had recovered.

Publications Issued.

Wedgwood: An Address, by the Right Hon. W. E. Gladstone, M.P., Chancellor of the Exchequer.—(*Murray.*) This is a reprint of the address delivered at the laying of the first stone of the Wedgwood Institute, at Burslem, October 26th, 1863.

A List of the Customs Ports and Inland Bonding Towns of the United Kingdom, by James Donelan, Collector of Customs at Exeter. (*Effingham Wilson.*) In this work the tables are arranged under the separate scale of salaries apportioned to the collectors by the recent revision of the establishments for the year ending the 31st December, 1862. They exhibit at one view numerous particulars of the trade, revenue, and establishments of each port, including the population in 1861; salaries of collectors in 1859 and 1862; total receipt of duties; number and tonnage of vessels, inwards and outwards, with cargoes; number and tonnage of vessels registered, belonging to each port, &c.

Queensland, considered as the field for British Labour and Enterprize, and the source of England's Cotton Supply, by George Wright. (*Street, Cornhill.*) The author, who was two years and a half resident in the colony, has just brought out a third edition of this work. He states that his aim has been to produce a work, cheap and practical, containing as much of detail as may enable a sensible man, should he emigrate to Queensland, to work his way there with a fair prospect of success; and he says that he feels persuaded that the industrious man who may be induced by its statements to emigrate to that colony will never regret that he has done so.

The Engineer's, Manufacturer's, and Miner's Vade-Mecum, by Dr. K. P. Ter Reehorst (*Cowper's-court, Cornhill*), presents, on a single sheet, a list, in five languages, of technical words not usually to be found in dictionaries.

A New Map of the British Isles; suitable for Halls, Offices, Libraries, &c.—(*William Westley, Paternoster-row.*) Price 30s. mounted on roller or folded in case. The size is 5ft. 6in. by 4ft. 10in.—This map shows all the towns and principal villages, and all the railways to the present date. It is printed from steel plates, and has been revised by the conductor of the Government Maps.

Forthcoming Publications.

A History of the World from the Earliest Records to the Present Time. By Philip Smith, B.A. (*Walton and Maberly.*) This work is by one of the principal contributors to the dictionaries of Greek and Roman antiquities, biography, and geography, and is an attempt to trace the story of Divine Providence and human progress in one connected narrative. It is proposed to condense it sufficiently to keep it within a reasonable size, but yet free from the baldness of an epitome. It is intended to follow the story of our whole race, from its beginning in the sacred records, and from the dawn of civilisation in the East,—through the successive Oriental Empires,—the rise of liberty and the perfection of heathen polity, arts, and literature in Greece and Rome,—the change which passed over the face of the world when Christianity sprung up,—the origin and first appearance of those barbarian races which overthrew both divisions of the Roman Empire,—the annals of the States which rose on the Empire's ruins, including the picturesque details of

mediæval history and the steady progress of modern liberty and civilisation,—and the extension of these influences, by discovery, conquest, colonisation, and missions, to the remotest regions of the earth. The more striking facts of history,—the rise and fall of empires,—the achievements of warriors and heroes,—the struggles of peoples for their rights and freedom,—the conflict between priestcraft and religious liberty, will occupy a prominent place, but they will not divert attention from the more quiet and influential working of science and art, social progress and individual thought. The work will be divided into three periods, each complete in itself, and will form eight volumes in demy octavo. 1. Ancient History, sacred and secular; from the creation to the fall of the Western Empire, in A.D. 476. Two volumes. 2. Medieval History, civil and ecclesiastical; from the fall of the Western Empire to the taking of Constantinople by the Turks, in A.D. 1453. Two volumes. 3. Modern History; from the fall of the Byzantine Empire to our own times. Four volumes. It will be published in monthly parts at 2s.; and half-yearly volumes at 12s. 6d.; cloth lettered. The first part appeared in November.

The Standard Guide to Postage Stamp Collecting, with their Values and Degrees of Rarity. (*Hotten*, Piccadilly.) This work, it is said, has occupied the authors, Messrs. Bellars and Davie, for three years. It includes an account of the Mormon stamp issued by Brigham Young in 1852.

Notes.

Metropolitan Fire Brigade Bill. — On the 15th December, a special meeting of the Vestry of Marylebone took place, to consider a proposal for the introduction of a Bill by the Government to take the fire brigade out of the hands of the insurance companies, and by means of a tax upon the ratepayers of the metropolis for its support, place the control in the hands of the Metropolitan Board of Works.

The Profits on Gas.—By a parliamentary return it appears that the Metropolitan Gas Companies paid dividends in 1862 as follows:—the Chartered paid dividends at the rate of 9 and 10 per cent., including back dividends at 1 per cent., per annum for the half-year to Christmas, 1856; the City of London dividends at 9 and 4 per cent., with a balance of £658; the Commercial, £30,513 on a capital stock of £322,195 (less sums remaining outstanding). The Equitable paid dividends at the rate of 11, 14½, 14, and 10 per cent. (less sums remaining outstanding), with a balance of £396; the Great Central dividends at the rate of 6 and 8 per cent. (less sums remaining outstanding), with a balance of £18,445; the Imperial at the rate of 10 per cent., with a balance of £58,500; the Independent at the rate of 10 per cent., with one year's back dividend (£1,500), and a balance of £3,548. The London paid £36,827 on £548,843 (less sums remaining outstanding). The Phœnix paid 10 per cent., with £8,190 dividend arrears for 1856, with a balance of £930. The Ratcliffe dividend was £8 15s. per cent., without a balance; the South Metropolitan, 10 per cent., with a balance of £10,369; the Surrey Consumers', 10 per cent., with a balance of £4,047; and the Western, 10 per cent., with £5,285, "towards back dividends of less than 10 per cent."

Pattern Post to Canada.—The Postmaster-General has issued an order, to take effect on and after the 1st instant: — Patterns of merchandise, similar to those already transmissible by post between any places in the United Kingdom at reduced rates, may be transmitted by post between England and Canada, by Canadian mail packet, at the following rates of postage, which must in all cases be prepaid by means of postage stamps, viz.:—4 oz. 3d., under ½ lb. 6d., under 1 lb. 1s., under 1½ lb. 1s. 6d., under 2 lb. 2s., every additional ½ lb. 6d. No packet of patterns must exceed two feet in length, breadth, or width; exceeding those dimensions it cannot be forwarded through the post. The patterns must not be of intrinsic value. There must be no writing or printing other than the address of the person for whom the packet is intended, the address of the sender, a trade-mark and numbers, and the prices of the article. The patterns must be sent in covers open at the ends, so as to be easy of examination. Samples, however, of seeds, drugs, and so forth, which cannot be sent in open covers, may be enclosed in bags of linen or other material tied at the neck; bags so closed that they cannot be readily opened, even although they be transparent, must not be used for this purpose.

Iron Clad Ships.—A correspondent of the *Standard* writes:—To whom should be accorded the merit of the first discovery of the use of iron-plating as a protection to ships of war, has been a matter of no little controversy. As none, however, pretend to lay claim to the invention at a date anterior to the present century, there seems scarcely a doubt that all claims must be waived in favour of the Japanese. In 1613 William Adams, in a letter from Japan, dated December of that year, in a mention of his voyage from Firando to Oösaka through the Inland Sea by the Strait of Simonoseki, writes thus:—'We were two daies rowing from Firando to Faccate. About eight or tenne leagues on this side the straights of Xeminaseque we found a great towne, where there lay in a docke a juncke eight hundred or a thousand tunnes burthen, sheathed all with yron, with a guard appointed to keep her from firing and treachery. She was built in a very homely fashion, much like that which describeth Noah's arke unto us. The naturals told us that she served to transport soulders to any of the islands if rebellion or warre should happen." So even the latest "reconstruction" in "wood and iron" is 250 years old. The locality is easily traced on the map. Fakata is in the bay of Hakosaki, a spacious harbour midway between Firando and Simonoseki, the distance given being almost exact; and the great town is doubtless Fukuoka, the capital and fortress of the Prince of Mino, on the shores of the same bay.

The Whitworth Institute.—This Institute, erected at Fleetwood, by the munificence of Benjamin Whitworth, Esq., at a cost of £2,000, was opened on the 15th December, by a tea and public meeting, presided over by J. A. Tarner, Esq. The Rev. R. S. Stoney bore testimony to the noble example of Mr. Whitworth, to whom an address was presented from the inhabitants of the town. Mr. Whitworth, in his reply, remarked that, whilst acknowledging the warmth of the reception given him, he only felt the erection of the Institute a matter of duty.

Industrial Exhibition.—The officers and men of the second battalion of the 12th Regiment have resolved to open to the public, on the 12th January, an industrial exhibition, in Dublin, where they propose to display such specimens of their handicraft and ability as their several tastes and previous avocations may suggest. An opening march, composed in the regiment, will be performed by its band at the opening of the exhibition. There is a photographic school attached to the battalion, and some specimens of this art will be shown. All the printing required for the exhibition will be executed by soldiers, at their own printing press. The articles exhibited will be sold, and the proceeds devoted to the regimental charitable funds.

South Kensington Museum.—The number of visitors on Saturday, 26th December (Boxing-day), was 8,382, of which 2,463 visited the new National Art-training Schools. The visitors on 26th December, 1862, were 5,962.

The Crystal Palace on Boxing-day.—The following totals are the numbers of visitors on each Boxing-day since the opening of the Palace:—1854, 10,935 visitors; 1855, 3,347; 1856, 5,645; 1857, 16,350; 1858, 26,398; 1859, 34,564; 1860, 23,267; 1861, 39,099; 1862, 33,315; 1863, 43,741.

A Submarine Ship.—Mr. Geo. Cheek, of the *Cambria Daily Leader*, writing to the *Times*, says—"I have had my attention called to an article which appeared about three weeks ago in reference to the Russian Government, who you state are now building a submarine ship, which is made to float beneath the water, and to rise and sink when required. It is to be worked by a compressed-air engine, and is fitted with apparatus for fixing torpedoes on the bottom of ships it proposes to sink. No doubt many of your readers will recollect having seen plans of such a ship, which I exhibited at the Society of Arts, 1858, and of the compressed-air engine, a small model of which I have made, from which model I demonstrated that I could obtain as great a pressure by air as by steam. I wrote to the Admiralty, and submitted my plans to them, which were returned about three months after by Sir Baldwin Walker, who stated that the Lords of the Admiralty were not then in a position to undertake them. I have not since then adopted any further steps to get the matter taken up, but, no doubt, the Russian Government, who are more in the habit of encouraging invention than our own, have taken copies of my plans, and are now working them out with the greatest secrecy. I may add one advantage which my submarine ship has over that which the Russian Government is building,—it is provided with a round house (or cupola) on deck, from which, when the vessel is raised to the level of the water, observations can be made of surrounding objects and country."

Water Mills at Argostoli.—Professor Ansted, in his work on "The Ionian Islands," says:—"A curious natural phenomenon occurs, and is taken advantage of, in the neighbourhood of Argostoli. At four points on the coast, the sea, at its ordinary level, enters a very narrow creek, or broken rocky channel, and after running somewhat rapidly through this channel and among broken fragments of rock for some distance, it gradually becomes sucked into the earth and disappears. By conducting the water through an artificial canal for a few yards, and so regulating its course, and forcing all the water that enters to pass in a single stream beneath an undershot wheel, power enough is obtained in two cases to drive a mill. Mills have, in fact, been placed there by an enterprising Englishman, and are constantly at work. The stream, after being utilised, is allowed to take to its natural channel, and is lost among the rocks. It is common enough to drive a wheel by a current of water going from the land towards the sea, but it is certainly rare, and, as far as I am aware, peculiar to the locality, to find mills driven by a current of sea-water, acting quite independently of tide, the water constantly and steadily rushing in over the earth's surface, and finally disappearing. It is not the river god pursuing the nymph, but the great Neptune himself invading the domain. It is indeed no wonder that the Cephalonians are proud of their mystery."

Forging Notes by Photography.—A prisoner having been convicted of forging Austrian bank notes by means of photography, a question was raised whether this amounted to an engraving of the notes in question, according to the terms of the statute. The judges considered the legal question that was submitted to them, and were unanimously of opinion that the prisoner had been properly convicted, and the sentence adjudged was penal servitude for six years.

Fees on Railway Bills.—There have been 304 railway schemes deposited. The fee on a deposit at the Private Bill Office of every document is £5, and £5 a day to the examiners to ascertain whether there has been a compliance with the standing orders. On each reading there is a fee of £15, and a similar fee on the report. Among the reforms recommended by the late select committee on the subject, the fees of the House and of counsel were declared to be too high. The forthcoming session is expected to be the busiest one since the year 1845, when railway projects were very numerous.

Correspondence.

SUPPLY OF FLAX.

Sir,—In the *Journal of the Society of Arts* of the 14th August last there are some interesting and important remarks by Mr. Baker, Inspector of Factories, on the decreased supply of flax. We have drifted into a cotton famine, and there is every appearance of a flax famine. For some years past persons have been satisfied with the old saying, "As is the demand so will be the supply;" but has not this supposed truism been exploded in the case of cotton? and I think I shall be able to show the same result as to the supply of hemp and flax.

Mr. Baker very justly observes, with regard to flax, if there should be a flax famine, as there has been a cotton famine, we should again suffer extremely, with the consciousness that by a little forethought those sufferings might have been alleviated if not averted.

Now the most important question is, whose business is it to look into these things, and provide against such contingencies? We write and talk about it, and there the matter ends.

The same gentleman remarks, "a company was started in Yorkshire, for the purpose of collecting flax in this country from the farmers, and preparing it for the trade; but the company has broken up for want of encouragement, even from the trade itself. No doubt our large flax spinners are quite satisfied with the great profits they are making through their agents and buyers in Russia and various parts of the continent.

Mr. Baker attributes the short supply of flax to its decreasing growth everywhere whence we have hitherto been supplied; this, I think, is a mistake. My firm conviction, from actual experience acquired in a visit I made some years since to Russia, is, that the Russians and other continental people are gradually working up their raw material of flax and hemp themselves; they are doing so with their wool, and are great competitors with us at our wool sales.

The quantity of first-class flax spinning machinery exported to the continent, particularly to Russia, of late years has been enormous, and some of our most talented men have been engaged as managers. I have heard some of our largest machine makers remark that, had it not been for the continental demand, at times they would have had scarcely anything to do. The Russians now have nearly a monopoly of the export trade of ships' cordage. Take up any of the colonial papers, and you find the Russian article quoted at £5 per ton advance on English rope. For this they have to thank English talent and machinery, having the raw material at home with cheap labour.

If anything, the growth of flax has rather increased in this country, more particularly in Norfolk and Suffolk, in which neighbourhood there is a flax rettory, conducted on the most scientific principles. I know of one farmer in that district who sold 5 acres of flax, as it stood on the ground, for £100. The cultivation of flax is increasing in Somersetshire; in fact, it has always been extensively grown there for the local manufacture of their celebrated east and west coker canvas, which has a world-wide reputation. A flax market has been held in Yeovil, Somerset, for many years; and landlords, instead of obstructing the growth of flax, actually give prizes for the best samples. It is found that when the seed is saved by the new method of pulling the flax just previous to its being ripe, allowing it to ripen on the ground, the fibre is equally good, and that from 18 to 24 bushels of seed to the acre is saved for cattle feeding; by this means, it is said, more is returned to the land than is taken out of it.

It was no uncommon thing in the West of England, many years ago, in war time, in a good season, for the farmer to be enabled to purchase the freehold of the land with one crop of flax. In many parts of England the art of cultivating and preparing flax is

entirely lost, when some sixty years ago every villager in England must have well understood it, having to supply the local demand of the domestic spinning-wheel, which has gradually been superseded by machinery. This local demand fell off, and this, joined with the great prejudice of landlords in former times against the growth of flax, caused the extinction of its cultivation in many districts. It was formerly considered a very exhausting crop, the seed at that time not being saved, but put into steep with the flax; but, whatever quantity might be grown in this country, the demand would be greater than the supply for the requirements of our extensive trade. I may observe that the increased growth of flax in Ireland this season has been 60,000 acres.

Several letters have, at various times, appeared in the *Times*, calling attention to the flax, or as it would be more properly termed, the hemp of New Zealand, more particularly a recent letter, signed "Phormium Tenax," where the writer says:—"It is found in almost every district, to such an extent that thousands upon thousands of acres of the most beautiful fibre rots on the ground, for want of cutting and gathering, which, if brought to this country, would give unlimited employment to the labouring population." These letters, from non-practical men, may amuse the general public, but with the manufacturer they only raise a smile.

The native-prepared fibre might be spun into yarn, for fine canvas and sheeting, but the quantity a native can do in a day is very small, not more than 12 to 14 lbs., he only using one side of the leaf, and throwing the rest away. Since the place has been colonised, native labour is much more valuable in other ways, so that very little fibre is thus prepared by them now.

Some enterprising settlers are experimenting on the whole leaf, and are tolerably successful, as in this way fibre can be produced in large quantities, but it is of the coarsest kind, something between Russia and Manilla hemp, and will never be adapted for other than rope-making purposes, which it is well suited for, both on account of its strength and also (if tarred) for its durability. A friend of mine, in Nelson, New Zealand, a great enthusiast as to the value and importance of this fibre, consigned to me about 3½ tons, three years ago. To test its real value I put into the hands of a first-class broker; it was put up with other fibres to public auction, and only realised £15 per ton. If it had any pretensions to be regarded as flax, it would have been worth three times that sum; but, to do New Zealand flax justice, I must also state that, like most colonial attempts in that way, it was badly prepared, and put loose into the hold of the vessel, like dunnage. Had it been well prepared and packed, it would have realised from £30 to £35 per ton, for rope-making purposes. My friend paid £20 per ton for it, cash on the spot; it cost £4 14s. shipping and other charges there; freight, insurance, dock, and other charges here, £21 7s. 3d. making in all £26 1s. 3d. for 3½ tons; so there was a clear loss to my friend of £45 18s. 10d. on that trifling quantity. The price realised at these sales is a good approximate criterion as to the real value of things.

We have also that valuable plant, the *Rhea*, a fibre of India, a most interesting plant; but at present, owing to the tedious native method of preparing it, it is far too costly for general use. The late Dr. Royle was of opinion that, if proper machinery could be invented for the purpose, it could be introduced at a less price than jute. Such a machine, I am convinced, could easily be invented, that would prepare, with one person, more in one day than can be prepared by the present mode in three or four weeks. But this would require a visit to India to try it in its green state.

In the *Journal of the Society of Arts*, of September 11th last, there is a most important and valuable communication on the subject of the cultivation of flax in South Australia, by Mr. MacCalman, to the Commissioner of Public Works, South Australia, where he remarks that hundreds of thousands of acres of wild flax grow along the banks of the rivers and on the immense alluvial flats and swamps. This quite confirms the views that I have for some years formed as to the practicability of flax being profitably grown in certain parts of Australia. A friend of mine, many years a resident in Australia, well versed in colonial affairs, gave me a great deal of information on the subject of climate, soil, the rainy season, &c., and from what I learnt, I felt convinced that that colony was well adapted for the growth of flax, for as it only occupies the land rather more than three months, and requires much moisture, the periodical rains would last long enough to bring it to perfection; and the dry, hot summer being well adapted for steeping and drying it, it could be got out of the steep vat in the morning, and be dry and crisp, ready for scutching, in the evening. This process in England, in a dripping summer, is very expensive and tedious, the flax being out sometimes for weeks, and requiring constant attention to turn it to keep it from rotting.

Having had some experience in steeping and preparing flax with all the newest improved machines for scutching, and having visited various rettories in England, Scotland, and Ireland, I prepared a paper for my friend, to get published in one of the leading Australian papers, but this was not done, as many persons considered the climate too dry for flax.

The latest accounts from South Australia state that wheat is quoted at 5s. per bushel, and twenty bushels to the acre. It is sometimes as low as 3s. 6d., but at 5s. per bushel an acre of land only produces £10, with every expense to be paid out of it; whilst if grown with flax, with only an average crop of two tons of flax straw and 18 bushels of seed to the acre, the crop when prepared would be worth £25, and the cost of cultivation would be little more than wheat. I could give you the items, from actual experience, but it would take up too much of your valuable space.

Some years ago I was in the habit of attending most of the public sales of hemp and flax. I remember several bales of steeped flax straw, about two tons weight, from Australia, put up to public sale. It was beautifully pressed and packed in sheets, and was sold for £6 per ton, less than the cost of freight and charges. Had this been properly scutched, there would only have been about 7 cwt. of flax to pay freight and charges on, all the rest being waste. This would have been worth £60 per ton, or about £21 for the 7 cwt. The freight and charges on this would have been not much more than £2, and two men or stout lads, with 2-horse power and a modern scutching machine, would have prepared it in four or five days. There is no doubt that we could get a supply of hemp and flax from our various colonies, but there is much ignorance as to the mode of preparing and packing fibres, which the above case is only one instance of, and yet there is no want of zeal on the subject.

If we reason from analogy, from the results of the introduction of woollen machinery on the continent, we may safely come to some conclusions as to the possibility of the inhabitants working up their flax. In the early part of the present century we were dependent principally for a supply of wool on Spain; after the peace of 1815 supplies came in from Germany; the quantity from the latter source rose, in 1836, to nearly 32,000,000 lbs., but it has since rapidly diminished. In 1818 only a few tons of wool came in from Australia, and this has now risen to more than 25,000 tons, besides other colonies we get supplies from. I believe the Act of Parliament for preventing the export of spinning machinery was only repealed some time between 1840 and 1850; large quantities of spinning machinery were exported long before that time, in spite of constant seizures by the customs, and since then all the above quantities of flax that we formerly imported from the continent are now worked up there, and, as I before observed, foreigners are buyers of Australian wool in our market to the extent of many thousand bales a year; so where would our extensive woollen trade be had we

not this large supply from our colonies? There is not the least doubt that in the course of a few years, the same results will follow as regards their flax; and it would not be very unsafe to predict, that, judging from the above experience, if we could establish a good system of cultivating flax in Australia, so as to get a supply from thence in proportion to the supply of wool, our continental neighbours would be coming here as purchasers of flax. As I once observed in a former communication, above alluded to, in a great maritime country like Great Britain, where our very existence depends on our supremacy at sea, and with our vast fleets of mercantile and war shipping, none of which, either steam or sailing, can put to sea without rope, lines, and canvas, is it wise, is it prudent, is it consistent with common sense, that we should be mainly dependent on one country for such an important staple as hemp and flax, and that country of such warlike tendencies? When there is only a rumour of war with Russia, it runs up the price of those commodities very much, as was the case in the last war with Russia, when many previously well-to-do manufacturers were ruined through it. This question is one that intimately concerns everyone, from government, who require supplies of cordage, &c., to the lowest individual; but it is difficult to move in it; government will not, and what private individual can do so?

I should say it is a subject eminently adapted for the serious consideration of the Society of Arts, for if by any means this Society could promote the discovery of fresh sources of supply, the country and government would owe it an everlasting debt of gratitude. The Society has many members who are practical manufacturers, and others who have given great attention to a supply of fibres from new sources, some of whom could afford vaulable information on the failure of the supply of flax from the colonies, from the utter ignorance displayed in its preparation for the market. There never was a time when flax could be more profitably cultivated in this country and the colonies than at present, not only from the great demand, but the great improvement made, also in the last few years in machinery for flax scutching, which was once a most injurious and unpleasant employment, from the workmen being in a complete fog, as it were, of fine dust. Machines of the most simple kind can now be so arranged, that operatives can be comparatively free from dust, and the quantity scutched would afford the high price of labour in the colonies. Many English farmers, from the low price of wheat for the last few years, have seriously thought of converting their land for grazing purposes, but the cultivation of flax would pay them much better, and afford increased cattle-feeding powers. I know several farmers who have cultivated flax for years, for the sake of the seed for feeding stock, and for some time the straw was allowed to rot as manure, but it is now turned to account. This plan is far more profitable than buying foreign oil cake; one peck of crushed seed, boiled in twenty gallons of water, being sufficient for twenty bushels of chaff. I should suppose it would be equally valuable for stock, in the dry hot months, in Australia.

To the farmer of small capital the cultivation of flax would be a great assistance, as it can be got off the land about the middle of July, and the straw sold to a rectory, it would put him in cash to pay his harvest hands, and, with a good dressing of manure, there would be time to get in a crop of turnips afterwards.

With good farm buildings, a capital of from £400 to £500, judiciously laid out, would purchase an 8-horse engine, shafting, and scutching machinery, to produce four tons of long flax per week, allowing eleven to twelve tons of straw to two tons of flax, besides a large quantity of tow, which would more than pay for scutching. But with a steam-engine, or water power on the premises, £150 would be sufficient, or a much less sum, if for scutching the produce of one farm only.

Nothing would advance the growth of flax in this country and the colonies more than for three or four good lecturers to visit our agricultural districts, where the subject is not understood, and give lectures, illustrated with models of the best scutching machinery; affording advice, where needed, on steeping, the best arrangement of vats, sorting, packing, &c. I think it more necessary for the colonies, as they have not the advantage of knowing what improvements are taking place.

If such a movement were supported by the government, and they only saved one-half per cent. on their purchase of hemp and flax, it would pay for several lecturers. The extra cost of this material to this country during the Crimean war must have been some millions. Our colonists would take nearly all out in British manufactured goods, while the Russians take as little as possible. Thinking this important subject well worth the serious consideration of the members of the Society of Arts, I leave it in their hands, wishing a more able advocate had undertaken it.

I am, &c.,
EDWIN WARD TRENT.

Brooksby's-walk, Homerton.

LUCIFER MATCHES.—SIR,—Having read the account of Mr. F. A. Abel's experiments at Woolwich on various descriptions of lucifer matches and his report on their comparative safety, it has recalled to my memory a description of lucifer which was introduced to the public, through the Society of Arts, many years since, by, I believe, a Mr. Barker.* I am under the impression that the Society awarded a medal to that gentleman for his invention, but that the Society's records will doubtless show. The object of Mr. C. Barker's invention was to give increased safety in the use of the lucifer, then a new invention, and also to make it available in climates and atmospheres which, either from excessive humidity or high temperature, rendered the ordinary match either useless or highly dangerous. As I do not remember to have seen any published account of Mr. Barker's match, and doubt if Mr. Abel had any to examine, I may perhaps be excused if I ask for so much space in your *Journal* as will admit of my attempting to describe it. The existing matches are, I believe, largely deteriorated in damp atmospheres by their ready absorption of moisture. Many readily explode with a sharp blow, and by much the larger proportion ignite at a comparatively low temperature. Mr. Barker overcame all such objections by merely making his matches with the phosphorus under the brimstone instead of over it. By so doing he coated the explosive and absorbent compound with a non-explosive and non-absorbent body. This he was enabled to do by first dipping his match in the explosive compound, and having dried it he then dipped it again in the liquid sulphur, and before the atmosphere had time to act through the coating it was plunged into a water-bath, which cooled and hardened it. The match was ignited by simple friction upon a piece of glass paper, which rasped off the sulphur and exploded the phosphorus in the usual manner. These matches I remember to have seen at railway stations and other public places at the time they were brought out, some twenty years ago, and I believe that the reason they failed to command the market was that they appeared to be merely an altered form of the old brimstone match, which had then scarcely gone out of use. I remember the above facts relative to Mr. Barker's match having used them at the time of their introduction, and I have frequently regretted my inability to obtain them, as I live in a somewhat damp locality, and have not unfrequently found the ordinary matches useless, while those I have attempted to call attention to I have placed in water (of course not above the sulphur), and after considerable immersion they ignited readily. The price was the same as the ordinary matches. I need scarcely add that a blow would not explode them, unless the sulphur was first broken off; and it required a high

* Mr. C. M. Barker's invention was brought before the Society in 1815, and was recommended by the committee as deserving of notice and the thanks of the Society.—ED. *J. S. A*

temperature (nearly 300°) to ignite the sulphur. If carefully packed for exportation they were also comparatively safe on board ship.—H. G. H.

MEETINGS FOR THE ENSUING WEEK.

MON. ...Entomological, 7.
British Architects, 8.
Medical, 8½. Mr. F. W. Mackenzie, "Retroflexion of the Gravid Uterus, with especial reference to its Occurrence in the latter months of Pregnancy."

TUES. ...Royal Inst., 3. Prof. Tyndall, F.R.S., "On Electricity at Rest and Electricity in Motion." (*Juvenile Lectures.*)
Pathological, 8. Annual Meeting.
Photographic, 8.
Anthropological, 4. Annual Meeting.

WED. .. Geological, 8.
Pharmaceutical, 8. 1. Mr. John Eliot Howard, "Note on the Root-Bark of Calisaya." 2. Mr. Daniel Hanbury, "Note on *Cassia moschata*." 3. Mr. David S. Kemp, "On Goa Powder." 4. Mr. T. B. Groves, "Note on the Recovery of Essential Oils from their Watery Solution."
R. Society of Literature, 8½.

THUR. ...Royal, 8½.
R. Society Club, 6.
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Electricity at Rest and Electricity in Motion." (*Juvenile Lectures.*)

FRI.......Astronomical, 8.
Archæological Inst., 4.

Patents.

From Commissioners of Patents Journal, December 22nd.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Cylinders of steam engines in the form of a segment of a cylindrical ring, and machine for boring them truly cylindrical, &c.—3103—W. H. Cole.

PATENTS SEALED.

1578. W. W. Sleigh.	1604. H. G. Craig.
1581. R. A. Brooman.	1606. A. Watson.
1590. T. Redwood.	1610. G. Boccius.
1591. P. R. Hodge.	1615. G. Clark.
1595. T. Skinner.	1618. J. Chatterton.
1600. T. Page.	1620. W. Andrews.
1601. J. O. Mathieu.	1621. C. Avery.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

3085. G. Davies.	3039. A. Verwey.
3086. G. Davies.	3101. T. W. Walker.
3088. A. Kinder.	3128. T. and B. C. Sykes.
3092. N. C. Szerelmey.	3146. E. Cook and J. Stokes.
3194. T. Gibson and W. and H. Knighton.	3132. G. B. Rennie.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2993. G. M. P. Swift, Viscount Carlingford.	3003. J. Brown.
3002. C. Fay.	3015. T. White.

From Commissioners of Patents Journal, December 25th.

GRANTS OF PROVISIONAL PROTECTION.

Aniline black, production of—3045—E. J. Hughes.
Bonnet front machines—3127—H. Kinsey.
Bricks, tiles, etc., drying—2526—H. Clayton.
Calendering machines—3153—W. Spence.
Cannon—3179—T. A. Blakely.
Cocoa-nut fibre—3125—E. Shepherd.
Cotton, carding—3139—B. Dobson, J. Hodgkinson, D. Greenhalgh, and F. Hamilton.
Draught-horses, lifting—3061—F. J. Walthew.
Fibrous materials—3137—J. Townsend.
Fire-arms, breech-loading—3159—T. Wilson.
Fire-arms, breech-loading—3171—J. Smith.
Fire-bars for locomotive engines—3165—W. W. Box.
Glass, grinding and polishing—3167—J. H. Johnson.
Heating, etc.—3055—S. A. and C. F. Varley.
Horse shoes—3041—J. Green.
India-rubber, dissolving—3183—C. Humfrey.
India-rubber soles for boots—3141—J. H. Johnson.
Looms—3175—J. Hindle, W. F. Calvert, and E. Thornton.
Oyster spawn and brood, cultivation of—2930—H. Ayckbourn.
Port closers for vessels of war, etc.—3115—W. Clark.
Puddling iron and steel—3093—T. Harrison.
Railways, shifting the points on—3135—W. T. C. Pratt.
Rice, machinery for cleansing—3161—H. B. Sears.
Roller for window blinds—3119—S. Tuchet.
Sash or shutter fastener—3117—R. W. Pyne.
Ships, steering gear for—3073—G. R. Tilling and J. Park.
Steam boilers, preventing explosion of—3111—H. Turner.
Sugar, extracting the syrups from—3123—J. Corby.
Sewing machinery—3181—A. V. Newton.
Transmitting motive power—3129—J. Cliff.
Washing machinery—3147—G. T. Bousfield.
Watches—3177—J. Gouvernon.
Wringing machines—3049—W. Williamson.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Ink—3204—E. T. Hughes.
Socks—3198—H. A. Bonneville.

From Commissioners of Patents Journal, December 29th.

PATENTS SEALED.

1625. J. G. Jennings and M. L. J. Lavater.	1720. A. R. Johnston.
1628. A. K. Richards.	1723. C. de Bergue.
1629. C. H. Gardner.	1733. E. D. Chattaway.
1631. S. Cole.	1739. H. Greaves.
1633. J. Blake.	1751. P. C. A. Jodocius.
1636. T. Boyle.	1752. H. A. Bonneville.
1637. C. P. Coles.	1789. B. Lambert.
1640. J. and J. S. Harvey.	1808. W. Simpson & J. Hutton.
1641. T. Taylor.	1815. A. A. Pelaz.
1644. J. Cole and J. Cole, jun.	1820. F. L. H. Danchell.
1645. J. J. Shedlock.	1832. P. R. Jackson.
1646. R. A. Brooman.	1888. W. and S. Firth.
1647. A. A. Croll.	1916. H. Woods.
1653. H. Broadhead and G. Murdoch.	1938. J. G. Pinede.
1655. R. Davison.	1975. E. Myers and H. Forbes.
1656. C. Baulch.	1981. J. G. Willans.
1657. H. Brinsmead.	2031. A. V. Newton.
1661. J. C. Macdonald and J. Calverley.	2050. A. Cruickshank.
1662. M. E. Eyth.	2057. W. Jackson.
1665. J. Gimson.	2116. F. Pragst.
1668. H. A. Bonneville.	2120. W. E. Newton.
1671. G. A. Barrett, W. Exall, C. J. Andrewes, A. Barrett, and J. L. Bowhay.	2145. G. Attock.
1676. J. M. Croft.	2176. W. Boulton and J. Worthington.
1684. E. Edwards.	2179. H. A. Bonneville.
1691. E. Myers and H. Forbes.	2180. H. A. Bonneville.
1715. W. E. Newton.	2464. C. Croswell.
	2525. P. Lesley.
	2574. G. H. Daglish & T. Windus.
	2683. H. Cochrane.
	2728. J. Tangye.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

3148. G. Sandys.	3175. G. Dodman and W. Bellhouse.
66. E. C. Shepard.	3180. I. Dimock.
3182. W. E. Newton.	3187. E. R. Burnham.
3176. A. V. Newton.	3172. W. Hill and H. Barber.
41. W. Taylor.	
53. W. Taylor.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

3079. J. Petrie & W. M'Naught.	3065. W. Irlam.
3059. C. F. Varley.	

Registered Designs.

Balance Trench Plough—4604—Dec. 11—Robert Dawes, Turnham-green, S.W.
Hand Rest—4605—Dec. 16—J. Banner, Exeter.
Repeating Linen and Paper Stamp—4606—T. R. Pinches, Oxendon-street, W.
Folding Wire Frame for Light Shades—4607—Dec. 22—Julius Zobel, 139, Euston-road, N.W.
Apparatus for Guaging Liquids—4608—Dec. 23—Wm. Smyth, Rotherham.
Wellington Blucher Shoe—4609—Dec. 24—R. H. Southall and W. Hallam, Manchester.
Spectacles—4610—Dec. 31—S. B. Solomons, Albemarle-street, W.
Watch-going fusee bottom—4611—December 30—F. B. Anderson, Birmingham.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, JANUARY 8, 1864. [No. 581. Vol. XII.

Announcements by the Council.

Reports of the Juries.

The complete volume of the Reports of the Juries on the Exhibition of 1862 is now ready, and is in course of issue to subscribers.

Prizes to Art-Workmen.

The works rewarded by the Society of Arts, and for which prizes have been given, have been placed, by permission of the Lords of the Committee of Council on Education, in the South Kensington Museum, and will be found in the Gallery of the Iron Museum, at the entrance to the Sheepshanks Gallery.

Cantor Lectures.

Courses of Lectures on the following subjects will be delivered during the Session :—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. Hastings, Esq., Barrister-at-Law.

Fine Arts Applied to Industry. By W. Burges, Esq.

Chemistry Applied to the Arts. By Dr. F. Crace Calvert, F.R.S.

The third and fourth lectures of Mr. Hastings' course will be delivered on Mondays, the 25th January and 1st February, at 8 o'clock ; the subjects will be as follows :—

Contraband ; its Nature and Usages.

Capture of Private Property at Sea ; present State of the Law as modified by the Declaration of Paris ; Arguments for and against its Continuance.

The Foreign Enlistment Act; its Operation on Commerce.

The following is a syllabus of Mr. Burges's Lectures :—

Feb. 8.—Lecture I. Introductory :—What is an art manufacture ? Advancing state of English manufactures in an art point of view. Much owing to Government Schools of Art. Impediments to further progress:—1. Want of a distinctive architecture in the 19th century fatal to art generally. 2. Want of a good costume fatal to colour. 3. Want of sufficient teaching of the figure fatal to art in detail.—Hints for the advancement of Art applied to Industry.—Design of following lectures:—1. To take one or two phases of some particular industry in past times. 2. To compare them with our own phase of the same industry. 3. To offer suggestions for our future improvement.

Feb. 15.—Lecture II. — *Glass.*—Antique glass, Venetian glass, modern glass (Powell, Chance, &c.); Mediæval stained glass; modern ditto; Mediæval enamels; modern ditto ; (Legoste of Paris.)

Feb. 22.—Lecture III.— *Pottery.* — Etruscan vases (Wedgwood); Italian majolica (Minton); Sèvres china ; modern biscuit.

Feb. 29.—Lecture IV. —*Iron and Brass.*—Antique bronzes; Mediæval ditto ; modern French bronzes (Barbédienne) ; Mediæval dinanderie; modern ditto (Hardman, Hart, &c.) ; Mediæval and Renaissance wrought iron; modern ditto ; cast iron.

Mar. 7.—Lecture V.—*Gold and Silver.*—Antique and Mediæval plate ; modern ditto (Elkington) ; Antique and Mediæval jewellery ; modern ditto; Antique and Mediæval coinage ; modern ditto.

Mar. 14.—Lecture VI.—*Furniture.*—Mediæval furniture, oak and painted ; Renaissance ; 16th and 17th centuries ; modern.

Mar. 21.—Lecture VII.—The Weaver's art ; Mediæval, Eastern, modern.

The Lectures will begin on each evening at 8 o'clock.

The Christmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of Institutions.

Banbridge Literary and Mutual Improvement Society.—The tenth anniversary conversazione of this Institution was held on Wednesday evening, the 16th December, in the church school-rooms. George Gerald Tyrrell, Esq., presided, and delivered an introductory address. The honorary secretary was then requested to read the report of the Executive Committee, which showed that the number of members is still increasing, and detailed the varied and extensive operations of the society during the past year. In consequence of the duties of the treasurer's and secretary's offices having become so onerous, a paid assistant officer was appointed last spring to discharge a combination of these duties. The treasurer read the financial statement, exhibiting a small credit balance. The chairman commented at length on the report and financial statement, and, as a pecuniary loss had been sustained on last year's lecture engagements, he generously undertook to draw a cheque in favour of the treasurer to supply the deficit, £5 13s. 9d. He expressed his regret that his predecessor, George Barry, Esq., was prevented from being present at this social reunion, to receive in person the society's address and presentation, which consisted of a silver salver, bearing an inscription. The entertainment was intermixed with musical performances.

Faversham Institute.—The monthly journal of this Institute for December, announces local examinations, for members under the age of 16, to take place on the 12th, 13th, and 14th of January. The subjects are arithmetic, English grammar and composition, English history, reading, and writing; and there are prizes of £1, 10s., and 5s. offered in each. To every member who may obtain a first-class certificate in the Society of Arts examinations, a prize of the value of 20s. will be awarded by the committee of the Institute. A lecture was delivered on Wednesday, Dec. the 16th, by Robert Hunt, Esq., F.R.S., on "The Influence of Light on Life." Subscriptions in aid of a fund for erecting a wall and fence in front of the Institute are being collected. Two concerts are announced. The Singing Class has been dissolved, at the request of its members, in order that a Musical Society might be established in connection with the Institute. The financial statement, from September 7th to November 17th, shows that the total receipts number £135 17s. 0½d., and that there is a balance in the treasurer's hands of £8 15s. Historical and geographical questions are given in this journal, answers to which are solicited from members under the age of 18. A book, of the value of ten shillings, is awarded to the member (under the age of 18) who shall furnish the greatest number of correct answers to the geographical questions contained in six numbers of the monthly journal; and to the member furnishing the next to the greatest number of correct answers, a book of the value of six shillings will be presented. The 2nd prize will not, however, be given, unless there be six competitors; and no prize will be awarded, unless there be three competitors.

Mossley Mechanics' Institution.—The Committee have resolved to afford to the other Institutions the interchange of privileges specified in the conditions of Union.

Newcastle Church of England Institute.—A lecture was delivered here on the 7th December, by D. Zenner, Esq., on the "Properties of Matter." There was a good attendance, and the chair was taken by the Rev. W. R. Burnett.

Westminster Working Men's Club and Reading Rooms, Duck-lane.—The 3rd anniversary meeting was held on Friday evening, the 11th December. Alderman Sir R. W. Carden presided, supported by Joseph Payne, Esq. (Assistant Judge), Rev. T. Wright, M.A., J. M. Clabon, Esq., E. Fry, Esq., &c. The chairman expressed his thanks to Miss Adeline Cooper for having invited him to preside for the third time at this prosperous institution, which must be called not only the parent of, but the model for, all similar efforts. So convinced was he of the importance of abundance of such clubs that he was about establishing one in Marylebone, towards which he would give £100. The report was read by Mr. Edward Stephens, Secretary of the Club, and a member of the Working Men's Committee. It stated that they had enjoyed a course of uninterrupted success. The simple plan of the foundress of the Institution, of combining the social element with the intellectual, and placing the entire management in the hands of a committee of working men, chosen by and from a body of the members, has proved so acceptable and popular, that the building has required to be enlarged twice since it was first opened three years since. It now consists of a social club-room for coffee, smoking, chess and draught playing, newspapers, &c., a library, kitchen, lavatory, &c., on the ground floor, and class reading and lecture rooms upstairs. The cost of the additional ground and enlargement, with fittings, &c., is £580, towards which the Marquis of Westminster has given £100, but £190 is still required. There are above 500 members, 148 new members having joined since the Club re-opened a month since; the subscription is one halfpenny a week, and the average attendance 130 nightly. There are 12 simple rules, which are strictly enforced by the Working Men's Committee, and the greatest order has been preserved, while there has not been one defaulter from any of the societies, or one book lost from the library, which has between 400 and 500 volumes. The reading, writing, and ciphering classes are held three times a week; there are also French, singing, and Bible classes. The Penny Bank has received £140 in deposits, the Enrolled Labour Society has granted to members 135 loans, representing a sum of £321, although the capital is but £95, divided among forty-nine shareholders; the Barrow Club has supplied nine barrows of £2 10s. each, to as many members (costermongers), instead of their paying for years simply for the hire of one; the Sick Society has assisted fourteen members with sums varying from 10s. to 20s. The Cricket Club numbers fourteen members, who practise in Battersea-park. All these societies had been managed entirely by working men's committees—Miss Adeline Cooper acting as treasurer. A Labour Registry had been opened, and the attention of employers was solicited, as steady workmen would there be met with. Two models of the club, "As it Was," and "As it Is," executed by a member, were shown. Fourteen lectures, on a great variety of subjects, many of them illustrated with diagrams, pictures, and chemical experiments, had been delivered during the year, gratuitously, by clergymen and gentlemen, and numerously attended. Applications for the rules and plan of management had been received from nearly a dozen places, and deputations from this club had attended, by invitation, at several meetings for the formation of Working Men's Clubs. Several addresses followed the reading of the report, Mr. Clabon incidentally referring to an interview he had with the Prince Consort, on the necessity of opening some places of recreation for the working classes. The proceedings were closed by singing the anthem, "God save the Poor."

THE RESOURCES OF GREECE.

The following is an abridgment of a communication made by a correspondent of the *Daily News*, and is calculated to afford a practical insight into the general condition of rural affairs in Greece:—

The favoured soil of Greece, owing to its geological character and climate, offers a greater variety of elements of prosperity than almost any other country. True, Egypt may be better for corn and cotton, Syria for tobacco, Spain for wines, Russia for flax, but Greece has soil equal to Egypt, she has land similar to the best tobacco ground of Syria; wines have been produced there as fine as those of Spain, and flax equal to that of Russia.

Viewed under these aspects, I need not point out that no branch of development can more seriously affect the highest interests, both present and future, of Greece and the Greeks; while none, unfortunately, has been hitherto more utterly and systematically neglected, both by the Government and the people.

I am about to describe an estate situated twenty miles due north of Athens, upon which is supposed to have stood the ancient Delphinium. It lies in a ring fence, with at least nine miles of sea frontage on the beautiful strip of sea between Attica and Eubœa, on which float steamers to Thessaly and Constantinople, &c; and as there are still remains of the ancient port of Oropus, the produce of the estate may be easily shipped to any part of the world. On the south it extends to a distance of about eight miles, the ground rising gradually in an irregular succession of plateaux to an elevation of nearly one thousand feet, the upper part of which is covered with timber—fir, oak, &c. Here and there may be seen acres covered with *Prunus semperflorens*, almond, *Prunus acida*, vine, fig, *Celtis Orientalis*, the arbutus, the myrtle, the wild lavender, and many other aromatic and flowering shrubs.

The property consists of about 25,000 English acres. Of these there are 3,000 acres, near the sea, of rich

alluvial soil, many feet deep, once famed as the ancient plain of Tanagra. Higher up are 2,000 acres of good sound calcareous soil. Then about 7,000 acres of land fit for cultivation, but which have never been touched; 8,000 are under timber, being principally fir trees; 4,000 acres of rough, wild land, although of little value, would serve for grazing goats, but not for sheep, as the bushes would tear off their wool. In addition there are about 1,000 acres of waste, including water and the beds of rivers.

On this estate fine wheat could be grown on a surface of 3,000 acres; barley on at least 6,000 acres; beans or peas on 4,000; Indian corn on 5,000 acres; tobacco on 6,000 acres. Of these last, however, perhaps only 2,000 would produce the best quality of tobacco, the remaining 2,000 giving larger crops, but of an inferior kind. Rice could be grown on almost any of the ploughed lands, there being a species that will grow on the higher ground without water. The usual method of growing rice on the low lands, under water, has been so generally found to breed fever, that it has been rightly prohibited, except in certain districts. Sesame, a most productive small seed, exported principally to France, where a valuable oil is extracted from it, can by good management be grown after a crop of wheat, and will produce the same return, thereby bringing in one year as much as £15 to £16 per acre. Oats will grow on most of the arable land, but they never do very well, and are almost unknown, all the horses being fed on barley and straw. About 1,500 acres of land on the property are admirably adapted for the vine, owing to aspect, soil, and elevation. The richer lands produce more grapes, but they are not so well suited for making good wines. If intended for sale green, or to be made into raisins, they answer very well, as the vine does not require any water during the summer; it is specially adapted to Greece; and it is very important that more attention should be given to its extensive cultivation. On the island of Santorene, where the best wine is made, the land is in a great measure composed of pumice stone, volcanic glass, and scoria. The way the vines are trained there is worthy of note, as being so very ingenious and uncommon. At about twelve inches from the surface they are twisted into the form of a basket; this, being formed of the old wood, which is always suffered to remain, saves any trouble or expense of stakes, and the grapes grow inside and around these baskets, well off the ground. The cultivation of the vine, if the disease will only keep off, ought to engage the special attention of the owners of the volcanic and limestone soils of Greece, particularly those that cannot be artificially watered, as by careful management £4 to £5 per acre can be realised. In the Lebanon the grapes are, for the most part, turned into a kind of treacle. The land is ploughed between the vines, which lie flat on the ground, and corn is grown between them. I found, after a most careful investigation, that the average return per acre is not less than £7 to £8.

The currant vine would grow, but I believe would not succeed; for it is strange, but true, that it will only grow to a profit in certain districts on the south of the Gulf of Corinth and parts of the Ionian Islands. It has been tried repeatedly elsewhere, but has invariably failed. The plantations have been extended considerably in their own localities, but at no great distance removed from them.

Cotton would grow on the greater part of the ground suited to other crops, if care was taken to select the seed suited to the different soils. The production of cotton in Greece may pay as long the present high prices are maintained; but I see no chance at present of any of the coasts of the Mediterranean, except Egypt, being able to compete with either America or India, unless it be in the cotton of the Sea Island character. The soil is suitable, the climate to a certain extent not ill adapted to it; but the drawbacks surpass the advantages, except at the present prices. Thus in Greece there is neither capital nor labour sufficient to produce any very large quantity. The same objection applies to Algeria, the best cotton districts moreover being too feverish there to permit their lack of population being easily supplied by colonists. In addition to this there exist various other impediments not enumerated in the Utopian programmes of cotton companies, or either military or civil governors. In Morocco, where I have seen the finest cotton produced, the disturbed political condition of the country, and its attendant risk to life and property, are not likely, at any rate for the present, to enable it to compete with such countries as Egypt. It must be remembered likewise that there is not an unlimited demand for the long staple, silky cotton, which cannot be sold in Manchester at less than double the price of the American short staple. Moreover, the autumn rains, which at times begin rather early in these parts, and continue more or less throughout the winter, varied by slight frosts, are a serious disadvantage when compared to Egypt for instance, where rain being scarcely known, and frost never, crop after crop is picked from the plants from September till February.

My advice, therefore, to cultivators of the soil in these regions would be, to turn their attention to other produce, which in the long run will pay better, and not exhaust the land, as cotton has been proved to do; no trifling consideration when we see thousands of acres in America already abandoned in consequence of being worn out by cotton cultivation. No doubt the cotton return has been great, but under the system recommended above, it would be as large, while at the expiration of twenty years, when the cotton planters' property has become worthless, the other proprietor would be in possession of land ten times its former value, although of course I would not exclude the growth of cotton in a proper rotation, if the demand renders it desirable.

Olives grow wild in many parts of the estate, and only want grafting to produce fine fruit to the value of many hundreds a year. Between the Dardanelles and Smyrna there is a wild uncultivated tract of country, covered with olives. Some few years ago it was taken at an almost nominal rent, and I heard lately that it is now bringing in over £2,000 a year, simply by grafting.

From the little attention that has been paid to the manufacture of oil in Greece it fetches a very low price in comparison to that of France and Italy; but I find that this is entirely due to want of care and skill in the preparation. They do not even separate the bad from the good olives, and are most negligent in refining the oil. Where proper attention was given to it by a Swiss gentleman on his own estate, I saw oil that had been valued as high by competent judges as the best French or Italian.

Oranges and lemons grow most admirably with the least care, and the produce is no insignificant matter even in a well-cultivated garden; a fact of which the one belonging to the Governor at Malta may serve as proof, the oranges out of it having fetched about £400 last year. The garden at Oropo is nearly the same size, and the soil much better; even allowing that the Malta oranges are more valuable, still good returns may be obtained. The produce of the garden consists of pomegranates, almonds, figs, grapes, and various other fruit trees, also very fine melons and vegetables. Apples do not do so well as pears, and the peaches and nectarines are generally hard, and have not much flavour, but they could be much changed and improved by cultivation.

The prickly pear (*Cactus opuntia*) grows 10 to 15 feet high, and produces an enormous amount of vegetable matter, but not the least use is made of this plant except as a fence, for which it is particularly well adapted, while its fruit is in some places eaten by the lower orders. The total disregard of this fleshy, massive leaf as food for cattle has always struck me as unaccountable, and it is only recently, upon investigating the matter narrowly, that I have discovered that it forms an excellent substitute for green food for cows, with a moderate admixture of hay, straw, or grain, the milk they produce while eating it being quite as good as when they are fed on the

best grass. This I can affirm, having for many weeks used no other. This may seem a matter of slight importance, but those who reflect that it covers acres of the poorest and driest soil in all these southern latitudes, where from the want of water no ordinary pasture can be made to grow, will hardly be disposed to undervalue it.

Thus, throughout Greece, no less than Dalmatia, and in a great portion of Sicily, Turkey, and Algeria, where the dearth of pasturage reduces the inhabitants in so many places to the exclusive use of goats' and sheep's milk, the simple exploitation of this plant, which only asks to be let run wild to multiply and thrive, would give the means of supplying Athens, &c., with good cow's milk and butter, no small consideration where this latter, as in the Levant, is reduced to an expensive luxury imported from Lombardy and England.

It should not be overlooked either that an abundant supply of milk is more conducive to the advancement and well-being of a country than many may suppose. There is not a good farmer who will not tell you that every animal on the farm will be nearly doubled in value by the liberal supply of good milk. Nor can it be otherwise, since it contains every element for the nourishment of adult life. What would the Smithfield Cattle Show, or the stockyard of our Royal Agricultural Society be, if the animals exhibited had been stinted in milk? To those who have any doubt as to the importance of milk as an article of food, I beg to state that most prize animals have drank the milk of perhaps two cows for a whole year or more. There is a race of horses in the desert capable of complishing the most extraordinary journeys, whose sole food is camels' milk.

To return to the estate. Lucern and all kinds of clover would grow most luxuriantly over five thousand acres, and produce a most valuable food for all the stock during the winter months, either green or made into hay. In Egypt the whole live stock of the country is tethered, from October till March, on lucern, and consume nothing else.

Among the trees, the mulberry, for silk worms, is, perhaps, the most important; it grows very fast, and beautiful silk is produced. Another point worthy of note, but which is little known in Greece, is, that the leaves, if not wanted for the worms, make an admirable food for cattle, which are very fond of them.

The pine trees on the upper part of the estate have been so badly treated and neglected that they are of little value. The owner, wishing to extract the most out of them, adopted the barbarous system of bleeding them of their sap for the purpose of obtaining a few leptas for the resin. His reply, when I remonstrated with him on the subject was characteristic:—"You milk your cows; why should not I milk my trees?" He had evidently forgotten to take the contrast of the final results into his calculation—cows not dying from the operation, whereas trees do.

Madder, which pays so well, and from which large fortunes have been realised in the districts around Smyrna, grows admirably in Greece, and a thousand acres of it could be grown on this estate. It requires a deep, dry soil. It is true that this is a crop demanding capital, as the roots are not fit to dig up for four or five years, but as the return then is both certain and very considerable (the seed alone pays the annual expenses), money would be forthcoming, as it generally is for whatever brings a sure profit. Other plants that yield valuable dyes grow well.

The mineral productions of the property are well worthy of attention. Coal crops out on the surface, but it is lignite, certainly far less valuable than our Newcastle or Welsh coal. As, however, they have proved for many years in Prussia that it is suited for burning on railways, and for all purposes where fuel is wanted, it must not be looked upon too lightly. The dredging machine employed for nearly two years at Chalcis was worked by an engine fed by this coal, from the government pits at Kumi.

Limestone is in abundance, and building stone of various kinds. There are clays and soapstone of the finest quality for making china, with abundance of the best brick earth, and decided traces of iron, copper, and lead in the clay, slate, mica, and quartz rocks.

The game consists of deer (at times only), wild boars, partridges, hares, quail, and woodcocks, but in no great abundance, for every man on the estate is armed, and the country is full, moreover, of eagles, hawks, magpies, grey crows, &c. Hence it is only wonderful that there remains any game at all. There is good fishing on the coast. Sardines are caught by thousands near Chalcis, and fine sponge is also found off the estate.

There are three villages on the property, and the peasants work patches of the land here and there, as let them by the year, giving a portion of the produce in lieu of rent. The taxes are paid the same way. Their dwellings generally consist of one large room, with the cattle at one end; but for seven or eight months in the year they sleep in the open air.

They live in the simplest manner—coarse bread, often from barley or Indian corn, a little cheese or fruit, being nearly their sole diet, while the men drink a little home-made wine, the women never; meat they rarely touch, often taking no more than one meal a day. In many parts they live almost entirely on chestnuts, and in Maïna on bread made from lupins, and dried or salted quail.

These tenants still use the plough as described in the old Greek authors, although they do not quite carry out Hesiod's instructions, that a ploughman should go naked. They have no implements but this plough, and thrash out their crops with horses' feet, by driving them round and round in a circle.

Neither there nor in other parts of Greece have they any idea that lime is suited for manure, that guano exists, that bones are of any use, that the manure made by the cattle is worth carrying to the land, or that change of seed is important. Thus, ignorant of the A B C of cultivation, their sole expedient consists in exhausting one piece of land after another. They can feel no ambition to improve their farms, from their insecurity of tenure, for although compelled to build their own houses, they are liable to be turned out without any compensation. I am happy to say, however, that things are not quite so bad as this in all parts of Greece. There are a few excellent owners of property, who do give their tenants some security and encouragement; but even these know but little of the management of their land or tenants, their best intentions being thus rendered almost nugatory.

No doubt all this is ignorant and retrograde in the extreme, but before Englishmen indulge, as I have often heard them, in wholesale abuse of the Greek peasant for wasting the manure from his cattle, they would do well to look at home.

It is amusing to hear a Kentish antiquarian wandering through Greece ridiculing the people for ploughing with a plough attached to two little cows which provide his family with milk, quite forgetting that his own tenants are perhaps at the very moment working the wet clay soil of his own estate with an old-fashioned Kentish plough, drawn by four great fat horses, nearly a ton weight each, with a man to hold the plough, and a great boy to drive the team, treading the clay land after heavy rain, every footstep of which is injuring the soil perhaps for two years to come.

With respect to the estate, its returns at present are not quite one thousand a-year, whereas, after three years, with sufficient capital and proper management it could not fail to return, after paying interest on the capital employed at 6 per per cent. and all expenses, at the very lowest calculation ten shillings per acre, taking one with another, which would give an increase of £12,500 a-year, after which, under favourable conditions, it must go on augmenting, if the minerals are worked, to an almost unlimited extent. But as the owner will neither let nor sell it on reasonable terms, feeling confident, as he

does, that when the laws relating to land and the working of minerals are changed it will be worth double, I see no prospect of extensive improvement taking place on this or any other estates till then.

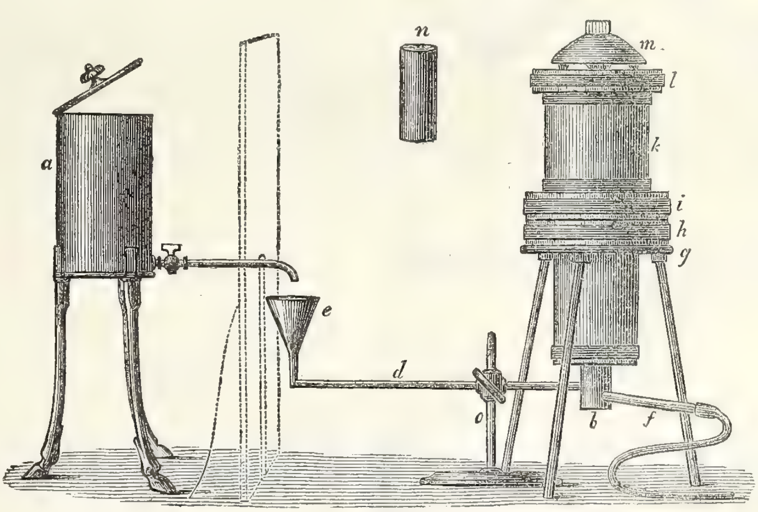
Nor is this by any means an exceptional case; for although Oropo is perhaps one of the finest properties in the kingdom, from its beautiful situation, its proximity to Athens, and its antiquarian interest, for it is hardly possible to turn up a stone at any depth in some parts without lighting on remains of ancient art, there exist many lands of equal value. Within a few miles there is an estate which ordinary tourists would glance at with scorn, as being poor and valueless; but its cottages are roofed with the fine lithographic stones which are supposed only to be found in Germany, and in many places are sold by the pound. Towards Thebes there is another wild district, under the surface of which a vast quantity of Meerschaum clay is found, which, when first extracted, is like a light yellow wax. Passing through Vienna I ascertained that this is worth from £9 to £11 per box, three feet by two and eighteen inches high. I have found, on a soil which would not grow cotton or corn, rocks of pure magnesia, which would yield a far greater return—a mineral unknown in that form, I believe, even in the Geological Museum of Jermyn-street; the magnesia of commerce being now extracted from the magnesian limestone, which is quite a different rock, and only contains about 13 per cent.

It would be well, therefore, for all those interested in the fate of Greece to give due weight to the facts and considerations above enumerated, for they apply to a great part of the country. Hence, too, the Government, possessing over two-thirds of the land, is even more deeply interested in these matters than any private individuals. If we only look at the increase in the taxation of this one estate, taken at a tenth on the gross produce, which the land could well afford to pay if judiciously and fairly levied upon a perfectly different system to the present; if, in addition, we consider what the Government lands now lying waste, or mismanaged, the minerals, quarries, salt works, fisheries, &c., might bring in, we may easily conceive what would be the augmentation of the revenue. Nor would the improvement stop here. It would tell alike on every branch of the moral, no less than of the material, advancement of the people and the country. The export and import duties must necessarily increase to a great extent, and political fermentation would be quieted, for turbulence and discontent are seldom rife amidst a thriving agricultural population.

OIL-LAMP FURNACE.

The object of the inventor, Mr. Charles Griffin, in producing this invention is to enable chemists and metallurgists, who have occasion to melt metals at a white heat, but who happen to have no command of coal-gas, to accomplish their purpose by other agents. This oil-lamp is stated to be not only as powerful in action as the best gas furnaces, but almost to rival them in handiness and economy.

Fig. 1.



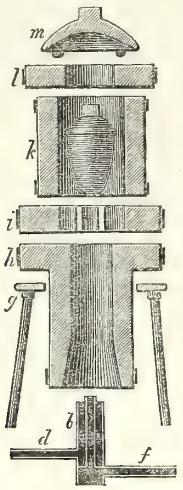
The Oil-Lamp Furnace is represented in perspective by Fig. 1, and in section by Fig. 2. It consists of a wick-holder, an oil-reservoir, and a fire-clay furnace. To these must be added a blowing-machine for the supply of atmospheric air.

The oil-reservoir is represented at letter *a*. It is made of japanned tinplate, mounted on iron legs, and fitted with a brass stopcock and delivery-tube. Its capacity is a little more than a quart. The wick-holder is represented at letter *b*, and the upper surface of it by the separate figure *c*. The wick-holder and the oil-reservoir are consequently detached. *d* is a tube which brings oil from the funnel *e*, and *f* is a tube to be placed in connexion with the blowing apparatus. The wick-holder contains three concentric wicks, placed round the multiple blowpipe *c*, which is in communication with the blowing-tube *f*.

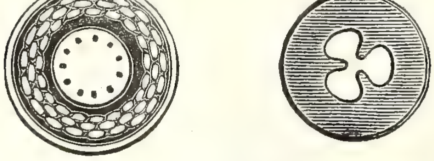
The crucible furnace consists of the following parts:—*g* is an iron tripod; *h* is a flue for collecting and directing the flame. This flue is of such a width, that when the wick-holder *b* is pushed up into it until the top of the wick is level with the top of the clay cone, there remains a clear air-space of about $\frac{1}{8}$ inch all round between the wick-holder and the cylindrical walls of the flue.—*i* represents a fire-clay grate, having three tongues, shown by *i*, the separate figure of its upper surface. These tongues support the crucible, without stopping the rising flame.—*k* is a fire-clay cylinder, which rests upon the grate *i*, and encloses the crucible, forming, in fact, the body of the

furnace. Of this piece there are three sizes: the smallest is of 3 inches bore, and works with crucibles that do not

Fig. 2.

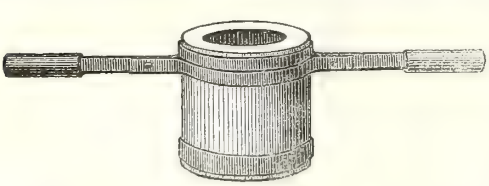


exceed $2\frac{3}{4}$ inches diameter; a middle size, 4 inches bore, for crucibles not exceeding $3\frac{1}{2}$ inches diameter; the largest



c i

size, 5 inches bore, for crucibles not exceeding $4\frac{3}{4}$ inches diameter. This piece being heavy, is provided with handles, as represented in the following figure. The



walls of these cylinders are from 1 inch to $1\frac{1}{2}$ inch thick. —*l* is a flat plate of fire-clay, with a hole in the centre, used to cover the cylinder *k*, so as to act like a reverberatory dome; *m* is a cover which prevents loss of heat from the crucible by radiation, but gives egress to the gaseous products of the combustion of the oil; *n* is an extinguisher to put over the wick-holder when an operation is ended; and *o* is a support for the wick-holder. No chimney is required.

When in use the apparatus is to be arranged as it is represented by Fig. 1. The cylinder *k* is to be selected to fit the crucibles, and that to suit the quantity of metal that is to be melted. 1 lb. of iron requires the smallest of the three cylinders described above; $1\frac{1}{2}$lb. the middle size; 5lbs. the largest size. The air-way between the crucible and the inner walls of the cylinder should never exceed one-quarter of an inch, nor be less than one-eighth of an inch.

The cotton wicks must be clean, and be trimmed a little below the level of the blow-pipe *c*. If properly managed, they do not readily burn away, but can be used for several fusions. The reservoir should be filled with oil for each operation. The proper sort of oil for use is the more volatile kind of mineral oil, of the specific gravity of ·750, which is now easily procurable at about three shillings per gallon. The variety known by the commercial name of turpenzine answers well. The combustion of a quart of this oil, costing ninepence, gives heat sufficient to melt 5lbs. of cast-iron. Probably the lighter kinds of paraffin oil may be suitable. Liquids of the alcohol class, spirits of wine, and pyroxylic spirit can be used, but they are less effective and more expensive than turpenzine. Care must be taken not to spill the oil on the table or floor, and not to decant it carelessly in the neighbourhood of a light, because atmospheric air strongly charged with the vapour of these light oils is explosive. When the oil is burnt in the furnace, in the manner described below, there is no danger. During an operation, a wooden screen, as represented by the dotted lines in Fig. 1, should be placed between the oil-reservoir and the furnace, to prevent the vaporisation of the oil by radiant heat.

As the wick-holder *b* and supply-pipe *d* contain only about one fluid ounce of oil, the oil must be run continuously, during a fusion, from the reservoir *a* into the funnel *e*, in order that the cotton may be always flooded. The success of the fusion depends upon the due supply of oil, to which point the operator must pay attention. At the commencement of a fusion, the oil must be run from the reservoir until the surface of the oil in the funnel has a diameter of about an inch. The wicks will then be flooded, and a light may be applied, and a gentle blast of air set on. The oil immediately sinks in the funnel; and the stopcock must be opened, and so regulated as to keep the oil barely visible at the bottom of the funnel. If too much oil is supplied, it immediately rises in the funnel, and simultaneously overflows the wick-holder. Too much vapour is then thrown into the furnace, and the heat is immediately lowered, especially at the beginning of an operation, before the fire-clay portions of the furnace are well heated. If, on the contrary, too little oil is supplied, the wicks burn, and the operation is spoilt. The demand of the wick-holder for oil depends upon the condition of the furnace and the character of the fusion in progress. When the lamp is newly lighted and the furnace cold, the oil should be passed slowly, in distinct drops; but, as the furnace becomes hot, the rapidity of the supply of drops should be increased; and, finally, when the furnace is at a white heat, the oil should be supplied in a thin continuous stream. When the fusion to be effected is that of only a small quantity of metal, such as 1lb. of iron, a rapid supply of drops of oil is sufficient even to the close of the operation. At that rate the burner consumes about $1\frac{1}{4}$ pint of oil in an hour. When the fusion to be effected is that of 4lbs. or 5lbs. of iron, and the large furnace is in action, and has been brought to a white heat, the supply of oil must be as stated above—in a thin continuous stream—and the operation will then consume 2 pints of oil in the hour. And here it requires remark that, with that continuous supply, when the furnace is large and is at a white heat, the oil does not rise in the funnel, being instantaneously converted into gas at the mouth of the burner, and thrown up in that state into the furnace for combustion. The operation, indeed, consists, at that point, of a rapid distillation of oil-gas, which is immediately burnt, in the presence of air supplied at a suitable pressure by a dozen blowpipes, in effective contact with the crucible to be heated.

The flame produced in this furnace is stated to be as clear as that produced by an explosive mixture of air and coal-gas. It is perfectly free from smoke, and the unconsumed vapours which occasionally escape with the gaseous products of the combustion, are even less unpleasant to smell and to breathe in than are those which are usually disengaged by a blast gas furnace, or by an ordinary lamp fed with pyroxylic spirit. The contents of a crucible under ignition in this furnace

can at any moment be readily examined, it being only necessary to remove the pieces *l* and *m* with tongs, and to lift the cover of the crucible, during which the action of the furnace is not to be interrupted. When the operation is finished, the blast is stopped, the stopcock is turned off, the oil-reservoir is removed, the wick-holder is lowered on the support *o*, withdrawn from the furnace, and covered with the extinguisher *n*. The quantity of oil which then remains in the lamp is about one fluid ounce.

The furnace being cold when an operation is commenced, it will melt 1 lb. of cast iron in 25 minutes, 1½ lb. in 30 minutes, 4 lb. in 45 minutes, and 5 lb. in 60 minutes. These results have been obtained by experiment. When the furnace is hot, such fusions can be effected in much less time; for example, 1 lb. of iron in 15 minutes. It need scarcely be added, that small quantities of gold, silver, copper, brass, German silver, &c., can be melted with great ease, and that all the chemical processes that are commonly effected in platinum and porcelain crucibles can be promptly accomplished in the smallest cylinder of this furnace; and, in the case of platinum vessels, with this special advantage, that the oil-gas is free from those sulphurous compounds, the presence of which in coal-gas frequently causes damage to the crucibles.

The size of the blowing-machine required to develop the fusing power of this Oil-Lamp Furnace depends upon the amount of heat required, or the weight of metal to be fused. For ordinary chemical operations with platinum and porcelain crucibles, and even for the fusion of 1 lb. of cast iron in clay or plumbago crucibles, a blowing power equal to that of a glass-blower's table is sufficient, provided the blast it gives is uniform and constant. But the fusion of masses of iron weighing 4 or 5 lbs. demands a more powerful blower, such as is commonly used in chemical laboratories, for the supply of air to blast furnaces when fed by gas or coke. The highest power of the Oil-Lamp Furnace depends, indeed, upon the power of the blowing-machine that is to be used with it. Much more than 5 lbs. of iron can be melted by the gas which this oil-lamp is capable of supplying, provided a sufficiently powerful blowing-machine supplies the requisite quantity of air. When more than a quart of oil is to be rapidly distilled into gas, and the whole of that gas is to be instantly burnt with oxygen, it is evident that effective work demands a large and prompt supply of air.

Manufactures.

LOCOMOTIVES.—The number of locomotives on the railways of the United Kingdom at the close of 1860 was 5,801; at the close of 1861 it was 6,156; and at the close of 1862, 6,398. Thus, an additional locomotive was brought into use almost every day, if Sundays be excepted. Even allowing twenty years as the natural life of a locomotive, upwards of 300 new engines would be required to keep up the stock every year at its present level; and irrespective of any foreign demand it may be affirmed that at least 500 locomotives will be required annually on home account for an almost indefinite period. Allowing £2,500 as the cost of each engine, the 500 new locomotives annually called for represent an aggregate of no less than £1,250,000. Between 12,000 and 13,000 drivers and stokers must be now regularly employed, and these men represent a population of at least 60,000 persons.

CUTTING OUT CLOTHES BY MACHINERY.—At the Government tailoring establishment at Millbank, where the army clothing is made, and about sixty sewing machines driven by steam are in operation, the material is cut out by machinery. A sharp thin endless riband of steel revolves like a band saw over pullies driven by steam, and the cloth in layers six to eight inches thick, with the pattern chalked on the upper layer is applied to the revolving knife, which rapidly and smoothly cuts it to the required shape, the hand of the workman being simply employed to guide the cloth so that the knife follows the chalked pattern.

SAFE KEEPING OF PETROLEUM.—On the 29th of July, 1862, an act was passed by which licenses for the keeping petroleum were required by the Metropolitan Board of Works. It appears that thirteen applications for licenses have been made, of which two only were granted, eleven being refused.

GENOA has now four foundries and mechanical establishments. The first, which is regarded as the most important metallurgical establishment of Italy, is managed by Messrs. Orlando Brothers, and has been in activity since 1848, when it was formed with a concession from the Government. The works employ 700 persons, and consume annually nearly 1,800 tons of pig iron and combustible. Most of the good workmen and foremen of Upper Italy receive their mechanical training there, the works producing every description of manufacture, such as rails, pipes, steam-boilers, &c. Fifty locomotives for the railways of the old Sardinian and Tuscan States were supplied from this establishment, and it is expected that the number of men employed will soon be increased from 700 to 1,000, as Messrs. Orlando, intending to undertake the construction of ships of war for the State, have just made very extensive arrangements with that object. The foundry of Messrs. Balleydier, which occupies 350 men, has an annual consumption of 1,000 tons of pig iron and combustible. The works of Mr. Robertson, again, employ 300 men, and consume annually 900 tons of materials. The fourth establishment was only brought into operation in 1860, by Signor Migone, a Genoese. At present it employs only 30 workmen, and its annual consumption of materials is limited to 30 tons. The hydraulic wheels and hydrodynamic machines of Mr. Robertson are highly esteemed in Italy; and Messrs. Balleydier Brothers also enjoy a high reputation for objects of domestic use and important works of art. Thus they have, during the last few years, erected bridges over the Bisagno at Genoa, over the Serivia at Seravalle, and over the Secca at the Val Polieveira.

THE SCOTCH IRON TRADE.—The development of the iron resources of Scotland makes steady progress. The variety of uses to which iron is being applied is stimulating production, and giving this country a leading position among the iron-making nations of Europe. In 1829, the year after the introduction of the hot-blast process, the total yield of Scotland was 29,000 tons. Fresh discoveries of iron ores being made, new works were erected, and in 1851 the production had increased to 760,000 tons per annum; the price that year averaging 40s. 1d. per ton, and the stock at the end of the same amounting to 350,000 tons. Now there are 134 furnaces in blast, and the computed production for the year just terminated amounts to 1,160,000 tons, thus showing an increase of 80,000 tons over 1862. The value of the make for the year at the present price represents £3,800,000. The average number of furnaces in blast was 127, employing about 45,000 men, and producing an average of 22,320 tons of pig iron weekly. The price is now 10s. per ton higher than the average price of the last eighteen years, and the highest reached since the revulsion of trade in 1857. Fluctuating between 55s. at the opening of 1863, and 51s. in May last, the price has recovered and ascended, with occasional reactions of a few shillings, to 68s. 6d., making the average price for the year 55s. 9d. a ton. The high price sustained during the past month in the face of dear money and declining exports, illustrates in a striking manner the sanguine views of capitalists who have been operating in this and other leading staples of produce. The shipbuilding yards on the Clyde, the foundries, and malleable iron works are generally actively employed, and the price of bar and angle iron has advanced fully 50s. per ton.

COTTON MANUFACTURES.—Spinners and manufacturers complain that the margin between the prices of the raw material and those of yarns and goods, entail a serious

loss on them; hence the desire to reduce production, in case matters do not speedily change for the better. The exports of cotton fabrics of the eleven months of 1863 compared with the preceding year, show still a slight decrease in quantity, but the declared value exceeds that of 1862 by £8,000,000 for cotton yarns and manufactured goods. The export trade is doubly important now, for inasmuch as it is proportionate to our imports it will mitigate the drain of bullion. The quantity of cotton taken for consumption in 1863 was 1,299,140 bales, against 1,041,860 bales in 1862; the actual export of cotton 467,120 bales against 416,440. The quantity taken for speculation last year was 1,275,510 bales against 1,660,100 in 1862.

Textile Manufactures.—In the manufacturing districts there has been great activity connected with the linen, woollen, and jute branches, the tendency being to displace, to a considerable extent, the consumption of cotton. The enhanced value of linen and jute fabrics may be estimated at thirty per cent. last year as compared with 1862. In the West of Scotland, from the improved prospect of the supply and the demand, as well as from the loss entailed in remaining idle, it is estimated that about three-fourths of the cotton-mill power is at work.

Commerce.

Sugar.—There are twenty sugar refineries on the Clyde, of which eighteen are at work and two on the point of commencing.

Dried Beef from the River Plate.—Imports of the South American dried beef from Uruguay, to which a medal was awarded at the last International Exhibition, continue to be made at Liverpool, where it is sold from the ship at the rate of £18 13s. 4d. per ton, or 18s. 8d. per cwt.

The late Gales.—At no recent period have the disastrous effects of storms been more severely experienced than during the hurricane of the 2nd and 3rd December last. Its results were felt, more or less, in all parts of the country. About 11 a.m. on the 3rd, the anemometer at the Royal Exchange, London, registered a pressure of 30 lbs. to the square foot. During the gales of October last, a similar instrument at Greenwich registered 29½ lbs., whilst the one at the Royal Exchange only showed a pressure of 18 lbs. It is supposed that upwards of two hundred and fifty vessels were wrecked during those two disastrous days, and that the loss of life was proportionately great. It is, however, very gratifying to find that, owing to the gallant and persevering exertions of the crews of the life-boats, two hundred and forty-six persons were happily saved from the numerous shipwrecks on various parts of our coast. During the year which has just closed 378 lives have been saved by the boats of the National Life-boat Institution, whilst in the same period 301 lives have been rescued by shore-boats, to the crews of which the Society has granted rewards, thus making a total of 679 persons saved from shipwreck during the year, through the instrumentality of this valuable institution. Since the beginning of the year (1863), the institution has also expended about £13,000, on its various life-boat establishments, on the coasts of England, Scotland, and Ireland. The number of lives saved, either by the life-boats of the Society or by special exertions, for which it has granted rewards since its formation, is 13,530, and since the establishment of the Institution it has granted 82 gold medals, 733 silver medals, and £17,730 in cash, for saving life from shipwreck, in addition to £80,000 expended by the Society on its life-boat establishments.

Shipbuilding on the Clyde.—The Scottish engineers and shipbuilders were remarkably active last year, the shipbuilding trade having taken a start as decided, compared with the years immediately preceding, as it took in 1854, which was the culminating point of a former period of progress. The vessels built during the past year, and now in the course of being built, represent 266,643 tonnage, or 100,000 tons above 1862, which was much on a par with 1854. Of this amount of tonnage only four per cent. is wood, two per cent. of wood and iron combined, and the balance entirely of iron. The returns are as follow of vessels built or in course of construction:—

	No.	Tonnage.	Horse Power.
Sailing vessels, iron	87	69,657	
„ wood and iron	4	3,638	
„ wood	19	10,280	
Screw vessels, iron	143	130,610	23,815
„ wood and iron	1	1,821	500
Paddle vessels, iron	76	50,637	16,573
	330	266,643	40,888

The shipping interest has not been so prosperous since 1852 and 1853, during the great tide of emigration.

Sweden.—Government is endeavouring to obtain such revisions of the Swedish tariff as will promote the interests of British trade. As a preliminary step the Government has applied to certain Chambers of Commerce for information relative to the operation of the high Swedish duties on the trade of this country.

The French Wine Trade.—The exports of *vins ordinaires* to England during the first ten months of 1863 amounted to 82,112 hectolitres, against 81,771 hectolitres in the corresponding period of 1862, and 81,000 hectolitres in the corresponding period of 1861. The exports to Belgium have been 70,608 hectolitres last year, against 117,168 hectolitres in 1862, and 75,787 hectolitres in 1861; to the Hanseatic towns, 81,018 hectolitres last year, against 88,264 hectolitres in 1862, and 77,771 hectolitres in 1861; to Italy, 143,429 hectolitres last year, against 124,789 hectolitres in 1862, and 222,976 hectolitres in 1861; to Switzerland, 205,759 hectolitres last year, against 227,324 hectolitres in 1862, and 207,652 hectolitres in 1861; to the United States, 62,237 hectolitres last year, against 73,413 hectolitres in 1862, and 74,191 hectolitres in 1861; to Brazil, 74,338 hectolitres last year, against 66,375 hectolitres in 1862, and 81,916 hectolitres in 1861; to Algeria, 208,331 hectolitres last year, against 191,614 hectolitres in 1862, and 188,897 hectolitres in 1861; and to other destinations, 456.941 hectolitres last year, against 581,728 hectolitres in 1862, and 456,937 hectolitres in 1861; making a total of 1,384,773 hectolitres last year, against 1,552,446 hectolitres in 1862, and 1,466,627 hectolitres in 1861. The exports of *vins de liqueur* in the first ten months of last year were 23,842 hectolitres, against 71,335 hectolitres in the corresponding period of 1862, and 69,656 hectolitres in the corresponding period of 1861. On the whole the shipments of French wines show rather a marked falling off last year.

The Wool Trade in general has been in a very satisfactory state during the year just ended, manufacturers with hardly any exception having been well employed throughout. The imports were again in excess of the previous year, the increase showing most in Australian and East India wools. The exports were also considerably larger than in 1862, France having taken eleven million pounds more of colonial than in the previous year, and America two million pounds more of foreign. The exports of woollen manufactures amount to considerably more to all parts of the world than they have ever done before, reaching in the aggregate for the eleven months ending with November, to no less than £27,400,000 against £15,257,000 for the same period in 1862.

Consumption of Paper.—From the last trade returns it appears that the consumption of foreign paper in England is considerably on the increase, 112,503 cwts. having been imported in the first eleven months of last year, against 92,288 cwts. in the corresponding period in 1862. Belgium supplies the largest quantity—no less than 61,950 cwts. out of the 112,503 cwts. having come from that country. In the eleven months ending November, 34,746 tons of rags used in the manufacture of paper reached the English market from abroad.

FRAUDULENT TRADE MARKS.—On Friday last, January 1, "The Merchandise Marks Act, 1862," came into operation. It makes it a misdemeanor to forge or counterfeit any trade mark, or falsely to apply any such trade mark, with intent to defraud, whether applied to a cask, bottle, stopper, vessel, case, cover, wrapper, band, reel, ticket, label, or any other thing in or with which any commodity is sold, or intended to be sold. It is henceforth an offence to sell or expose, either for sale or for any purpose of trade or manufacture, articles with forged or false trade marks, under a penalty of a sum equal to the value of such articles, and a sum, besides, not exceeding £5 nor less than 10s. Every addition to and every alteration and imitation of any trade mark made with intent to defraud—the intent being of the essence of the offence in all cases—is to be deemed a forgery, and punishable as such—namely, in addition to the penalties for misdemeanor, by the forfeiture of every instrument used for the purpose of the fraud, and of every article to which such false mark shall be applied. It is made obligatory on every person who shall sell an article having a false trade mark to give information, on a demand in writing being made upon him, as to where he procured it; and power is given to justices of the peace to summon parties refusing or neglecting to afford such information, and, in the event of their persisting in their neglect or refusal, to impose a penalty of £5. To mark any false indication of quantity upon an article with intent to defraud is made punishable by a penalty equal to the value of the article, and the payment of an additional sum not exceeding £5 and not less than 10s. A conviction under the Act is not to affect the civil remedy at law, in equity, or otherwise; nor in any indictment, information, or proceeding under its provisions need an intent to defraud any person in particular be alleged or proved. The punishment on conviction of any offence which by the act is made a misdemeanor is to be, at the discretion of the court, imprisonment for not more than two years, with or without hard labour, or by fine, or both; by imprisonment, with or without hard labour and fine, and also by imprisonment until the fine (if any) shall have been paid and satisfied. The time for taking proceedings under the act is limited to three years next after the commission of the offence, or one year after its first discovery by the person proceeding. The vendor of an article with a trade mark is to be deemed to warrant or contract with the purchaser that the mark is genuine, unless the contrary shall be expressed in some writing signed by or on behalf of the vendor and delivered to and accepted by the purchaser. The seller of an article, too, with a description upon it of its quantity, is to be deemed to contract and warrant that the description is true, unless, as before, the contrary shall be expressed in writing delivered to and accepted by the buyer. In suits at law or in equity against persons for using forged trade marks the court may not only order the article to be destroyed, but may by injunction stop a repetition of the offence.

Colonies.

NEW KINDS OF COTTON.

BY P. L. SIMMONDS.

In the Natal Court of the late Exhibition I was much struck with some samples of vegetable fibre, which, in its texture and colour, more resembled wool than cotton. I have since, after some research and investigation, traced out the plant producing it, which is the *Batatas paniculata*, Ch. (*Ipomœa insigni*, Bot. Mag. 1790). It is No. 94 of Kraus's Natal plants, and the following description of it from Don's "History of the Dichlamydous plants," will serve to identify it:—"*Batatas paniculata*, Chois. Twining, glabrous; leaves palmate, 5-7 cleft; lobes ovate-lanceolate or elliptic, bluntish, rarely sub-acuminated; peduncles much exceeding the petioles, many-flowered, dichotomously and corymbosely panicled; sepals, ovate roundish, concave, very blunt, equal, perennial, herbaceous. Native of the East Indies, banks of the Irawaddi, &c.; New Holland, Java, Guinea; Cayenne, and the banks of the Orinoco in America. Root thick, round, in the Guinea plant elongated, leaves large, 3-4 inches long and as much broad, corolla large, purple, capsule usually four-celled, but sometimes three-celled by abortion, seeds furnished with long hairs at top, which are bent in within the capsule." Flowers in June and September. Introduced in 1799. Of the cultivation of the species in general, Don says:—"The species of Batatas are strong, free-growing plants, of easy culture, only requiring plenty of room to spread. They are well adapted for trellis work, or to run up pillars in stoves. They are all tuberous-rooted plants; and therefore require to be kept dry when in a dormant state. Light rich soil suits them best. Young cuttings strike root readily under a hand-glass in heat. They are all very showy when in blossom."

Now the questions to be determined are, the suitability of the fibre for spinning, its probable value, and whether it could be cultivated with advantage. I would simply draw the attention of persons abroad to the expediency of collecting and sending home a sufficient sample to determine whether it could be easily separated from the seed, spun, and dyed.

The appended extract from a letter which I received by the last mail, from Mr. John Robinson, of Natal, calls attention among other things to another species of cotton growing wild in that part of South Eastern Africa.

"I enclose you a small sample of perfectly wild cotton that has just been brought me from Zululand. It was found at the base of the Bomba mountains—a range of heights 100 miles north of Natal, and about 25 miles from the sea coast—parallel with St. Lucia Bay. In this locality the plant grows indigenously in great abundance. You will be better able to judge of the quality than myself. I also send a seed with it. The gentleman who gave me the specimen has just returned from a hunting trip in those regions. There is a vast field of undeveloped wealth here if one only had time, or knew how to make use of it. A sort of wild vegetable silk abounds also, and as soon as I can get some you shall have a specimen. I have introduced Latakia tobacco here with great success, the seed being personally procured on the spot. It grows even better than in its proper home. The variety had not reached Australia, I was informed by a Victorian colonist, and I have therefore sent a considerable quantity of Natal grown Latakia seed to Melbourne, where it will doubtless thrive. An effort will be made shortly to introduce the Alpaca here. No country ought to suit the animal better than one in which deer of every kind are so abundant. In the Cape colony also an effort to acclimatise them is about to be made. The mineral wealth of Natal has attracted the notice of some British capitalists, and a company has been formed to work the coal and iron mines of the colony. The legislature has promised it a 30 years' exclusive right to mine and export on condition of it—the company—making a railway to the coal fields, about 130 miles from the port. Six miles of crown land along the line has also been promised. The coal is good and abundant, in seams from five to eight feet thick. If the scheme is carried through it would work wonders in this part of South Eastern Africa."

In the last volume of the *Journal* of the Society, p. 655, it is stated that cotton had been found in Cuba growing on a vine which runs along the ground. It is not very fine, but white and strong, and has been tried, it is said, in various parts of Jamaica.

The few facts cited seem to show that there are new cotton-yielding plants yet to be experimentalised on, which promise useful results.

Natal.—The breed of horses in this colony has improved greatly of late, several valuable entire horses having been imported from England. The demand for horses in Natal is, however, small, and unless some outlet for this description of stock can be found, the market will soon be glutted. An excellent description of horse, fitted for Indian cavalry, could be found here, from three years of age upwards, for about £20 each. The horses in Natal are stronger and more developed, harder, with better feet and legs, than those in the Cape colony. They are very docile, and stand the heat better than any horses out of Asia. Mr. Duffield, a gentleman largely interested in the importation of alpacas in Australia, states that from his experience in these animals, and his knowledge of the climate of Natal, he has not the slightest doubt that they would thrive well there. The luxuriant pastures of Natal, now virtually waste for want of stock, seem to be admirably adapted to the habits of these animals.

Prince Edward Island.—The population of the island, by the census returns taken in 1861, was 80,857, an increase of 13 per cent. in six years. The number of acres of land under cultivation has increased since 1855 from 322,298 to 368,127 acres. There still remain nearly one million acres in a wilderness state, of which but little is incapable of cultivation. Oats and potatoes are the largest crops raised. Fishing occupies a large share of attention, as there are 1,300 boats engaged in the shore fisheries. There are many manufactories in the island, including 55 tanneries, 176 saw-mills, and 46 carding-mills.

New South Wales.—The abstraction of her pastoral districts by the establishment of new colonies from her former territory is greatly reducing the number of sheep in New South Wales, although the horned cattle and live stock progress. In 1850 New South Wales owned over thirteen million head of sheep, but the establishment of Victoria as a separate colony in 1851 reduced the number of sheep in the boundaries of the old colony below seven-and-a-half million; these increased in five years by about one million, but the separation of Queensland in the close of 1859 again brought down the number to five millions, and now the old colony scarcely owns more than five-and-a-half millions, whilst the younger offspring, Queensland, with its extensive pasturage, has more than four million sheep.

Gambia.—The average exports of ground nuts, the staple article from this colony, were, in the ten years, 1850 to 1860, 11,196½ tons; in 1861 they had increased to 12,632½ tons, of the value of £101,060. A large quantity of these go to Marseilles to be crushed for oil, used in soap-making. Hides, wax, and ivory are the other exports, amounting in value to about £24,000.

In Tasmania endeavours are being made in favour of a Grand Trunk Railway from Hobart Town to Launceston. The capital required is estimated at about 1½ million sterling.

New South Wales.—Silkworms.—At a recent meeting of the Acclimatisation Society, Dr. Bennett read a letter from Mr. Baker, of Young, dated September 20th, respecting the introduction of the silkworm which feeds upon the foliage of the castor oil tree, the Arrindy silkworm. The writer of the letter expresses a desire of having some of the worms for the purpose of rearing them, in the district in which he resides. Dr. Bennett mentioned that, as many letters had lately been received by the society from various parts of the colony on the same subject, it might be advisable to state that every exertion was being made by this society, as well as also by that of Melbourne, for the introduction of this valuable silkworm from Calcutta. All those that had been as yet sent from India had perished during the voyage; but as better arrangements were being made for insuring their surviving the transit, the society hoped before long to gratify the wishes of the members by being able to announce the safe arrival of these silkworms for distribution.

Jamaica.—The number of immigrants in the island on the 30th September last was 6,096; namely, 152 Portuguese, 226 Chinese, 3,955 East Indians, and 1,763 liberated Africans. The necessity for providing an island institution in which the youth of the colony may undergo a systematic training and acquire professional education is engaging the attention of the Legislature. It was referred to in the Legislative Council by the Hon. Dr. Hamilton, in a speech on the medical and sanitary wants of the country, and it will shortly be brought prominently to the notice of the Assembly, Dr. Bowerbank having notified that he will, on an early day, enquire of the members of the Executive Committee whether the Government have in contemplation the introduction of any measure for the consolidation and amalgamation of the different educational charities or behests of the island for the purpose of establishing a public or island college.

In St. Vincent a famine prevails, in consequence of the total absence of rain for the last 15 months.

Gold in New Zealand.—The total value of the gold raised in the province of Otago, in New Zealand, during two years, has been £4,024,080. The province of Otago proves to be one vast gold field. Rich diggings are constantly being discovered there.

Australian Gold.—The supply of gold brought down under escort to Melbourne, from the 1st January to the 23rd October, 1863, was nearly on a par with that of the previous year, being 1,160,013 ounces. The total produce of the Victorian mines, in 1862, was 1,393,874 ounces; the average of the three years immediately preceding being 2,014,581 ounces. The following have been the imports of gold into the United Kingdom, from Australia, in the last six years:—

1858 ...	£9,725,108	1861 ...	£6,474,451
1859 ...	9,830,944	1862 ...	6,310,500
1860 ...	6,659,590	1863 ...	5,164,752

Arrowroot.—The production of arrowroot is declining in Bermuda, Natal, and other colonies. In Bermuda, the value of the arrowroot imported declined from £10,334 in 1851, to £4,291 in 1861. The cultivation of arrowroot, being attended with some trouble and requiring skilled labour, has given way to that of the potato and the onion, which give crops as precarious as the arrowroot, and require a greater breadth of land, but as they can be grown by any one who can handle a spade they are largely undertaken by the poorer classes. In Natal, the culture of arrowroot which was formerly the most remunerative product of the coast districts, has now been almost entirely superseded by that of sugar.

Obituary.

Rear-Admiral Washington, Hydrographer of the Admiralty, died at Havre, on the 16th September, 1863, after a painful illness of several months' duration, brought on by excessive mental labour. About the beginning of last summer his medical advisers strongly recommended a complete cessation of his duties, and he accordingly went to Normandy, where he frequently spent his vacation. This, however, afforded him no relief. His bodily frame continued to give way under the pressure of a complaint which, with but slight external symptoms, had been from the beginning of the present year undermining his constitution. He was in his sixty-fourth year when he died, having been born on the first of January, 1800. He entered the Navy on May 15th, 1812, as a first-class volunteer on board the *Junon*, 46 guns, Captain James Saunders, fitting for the North American station, where he took part in many operations in the River Chesapeake. Removing as midshipman in the following October to the *Sybille*, he sailed

in that ship in 1814, under Captain Forrest, with the *Princess Caroline*, Captain Downman, for the latitude of Greenland, in fruitless pursuit of the American Commodore Rogers. In November of the same year, having returned to England, he entered the Royal Naval College at Portsmouth. On leaving the Royal Naval College, he was received, in May, 1816, on board the *Forth*, Captain Sir Thomas Louis, under whom he was again employed for upwards of three years on the Coast of North America. He then in succession joined the *Vengeur* and the *Superbe*, both on the South American station, where he remained until after his promotion to the rank of Lieutenant, which took place on the 1st January, 1821. He was subsequently employed on particular service, and in August, 1830, was appointed to the *Royal George*, 120, as flag-lieutenant to Admiral Sir John Poer Beresford, Bart., Commander-in-Chief at the Nore—continuing to serve under that officer in the *Ocean*, until advanced to the rank of Commander in 1833. To the active service, consequent upon his various appointments, he had united the practice of maritime surveying, and the combined pursuits of a Scientific Hydrographer and Geographer. In 1835 he succeeded Captain Maconochie as Secretary of the Royal Geographical Society of London, but resigned that office in 1841, on being appointed to continue the survey of the North Sea, which had for some time been in progress, in which he was continually engaged until the close of 1844. In 1842 he was promoted to the rank of Post-Captain, in compliment to the King of Prussia. In 1845, he was appointed a Member of a Royal Commission for inquiring into the state of the rivers, shores, and harbours of the United Kingdom. He was subsequently engaged in an inquiry into the condition of the fisheries on the North-east Coast of Scotland. His able report, and the clear plans of the different classes of fishing-boats which accompanied it, prepared expressly by Mr. James Peake, Master-Shipwright of H.M.'s Dockyard, Devonport, deservedly attracted considerable attention. In 1858 Captain Washington became a Member of the Royal Commission to inquire into the sites for Harbours of Refuge along the coasts of the United Kingdom. In the year 1862 Captain Washington was promoted to the rank of Rear-Admiral. In 1849 an awful accident with a life-boat occurring at the mouth of the Tyne, induced him to put forth his best energies to prevent the recurrence of similar disasters, and he gave his valuable services to aid the Duke of Northumberland, who, with a view of procuring a better description of life-boat, offered a prize of £100 for public competition. The result of the labours of the Northumberland Committee was embodied in an elaborate and valuable report prepared by the late Admiral. Together with this report was published the first Wreck Chart of the British Isles. Its unique appearance excited great attention, and to Admiral Washington is unquestionably due the credit of the compilation and publication, under the authority of Government, of the Annual Wreck Register and Chart of the United Kingdom. In 1853, Captain Washington visited some of the Russian fortresses in the Baltic. In the following year the war broke out, and the results of his acute observations during that tour proved of the greatest value. In the year 1855 he was appointed by Sir James Graham to the responsible office of Hydrographer of the Admiralty, on the retirement and special recommendation of the late Admiral Sir Francis Beaufort, F.R.S. One of the last public labours of the late Admiral was to act as a Juror at the International Exhibition of 1862. He was unanimously elected Chairman of the section which embraced those objects he had so long studied. In 1833, Admiral Washington married Eleonora, youngest daughter of the Rev. H. Askew, Rector of Graystock, in Cumberland, by whom he had three sons and one daughter. His funeral took place at the Protestant cemetery of St. Marie, Havre, on the 19th September, with every demonstration of respect on the part of the foreign authorities of the town. The heads of departments at Havre,—civil, naval, and military—attended the funeral. Officers and men of the imperial yacht *Prince Jerome*, to the number of forty, formed part of the *cortège*. The English ships in the harbour hoisted their colours half-mast high, the captains of two large steamers volunteered their attendance, and six of their seamen were gratefully accepted by the family as bearers. The Lords Commissioners of the Admiralty afterwards expressed officially to the authorities of Havre, their deep sense of the honours so gracefully bestowed. In 1852, he delivered a lecture before the Society of Arts, on the "Progress of Naval Architecture as indicating the Necessity of Scientific Education, and the Classification of Ships and of Steam-engines: also, on Life-boats," one of the Series of Lectures on the "Results of the Great Exhibition of 1851," delivered at the suggestion of H.R.H. Prince Albert, the President of the Society. He was a Fellow of the Royal, Astronomical, and Geographical Societies; an Associate of the Institution of Engineers; as also a corresponding Member of several foreign Geographical Societies.

James Tulloch, F.R.S., was born in London, on the 7th February, 1788. He was sent at an early age to France and Holland, for the purpose of acquiring the modern languages, with a view of becoming a foreign merchant: but after a residence of several years at the University of Leyden, he returned to England, and joined his brother, John Tulloch, in commercial pursuits, which they successfully carried on until the peace in 1815. He then visited various parts of the continent, turning his attention especially to objects connected with industrial progress and advancement. He observed, while on his tour, the extensive use of marble, arising from the low price at which it was obtained as compared with that in this country. This circumstance suggested to him the desirability of applying machinery to the sawing and otherwise working marble, and in 1820, under the advice of the late Bryan Donkin, he patented machinery which he had invented for this purpose. In 1821 he formed a joint stock company, for importing marble and working it by his machinery, which proved itself eminently successful, and so much so, that to this day there has been no material deviation, if any, from the plan he originated. The application of this machinery has been the means of considerably reducing the cost and increasing the consumption of manufactured marble in this country. The late Professor Cowper, of King's College, gave the following evidence before the Parliamentary Committee on the Arts and Principles of Design, in 1836:—"Question 614. Is there not some tendency now existing towards the conversion of various marbles to purposes of art? Answer. There is, both as to the various marbles and various other materials. At the Marble Works, Esher-street, Horseferry-road, there is a beautiful system of machinery for working ornamental marble: mouldings, slabs, and pilasters, of beautiful workmanship, are executed in British and foreign marbles at a low price. The whole is the contrivance of Mr. Tulloch, an independent gentleman of great taste, as his large collection of paintings by the old masters testifies. He, from observing the great use of marble in Italy and other countries, contrived this machinery for the express purpose of introducing marble into more general use in this country." In 1821, in conjunction with his brother, he originated the Guardian Fire and Life Insurance Office, which is now one of the leading insurance offices. On his retirement from the office of managing director, in 1856, the directors presented him and his brother also, each with a handsome vase, in testimony of the high sense entertained of the ability, zeal, and important services rendered by them. After resigning his office he employed his leisure in following his favourite amusement, the study of the works of ancient and modern masters, of which he had several fine specimens in his gallery. Mr. Tulloch died 22nd March, 1863, aged 75 years. He was elected a member of the Society of Arts in 1842.

Publications Issued.

A Handbook of Practical Telegraphy. By R. S. Culley, Telegraphic Engineer, London. (*Longman, Green, and Longman.*) This work is addressed to those who really require it, the practical men engaged in telegraphy, and it is published under the sanction of the chairman and directors of the Electric and International Telegraph Company. The work is divided into ten parts, and treats of the laws which regulate the application of electricity to telegraphic purposes; the methods adopted to detect faults and defects, and where they are situated; the management of apparatus, and the general construction of lines.

A Map of the Metropolitan Railways. Sheet, 2s. 6d., mounted in case, 4s. 6d. (*Edward Stanford.*) This shows the lines in operation and sanctioned; also the proposed railways, plans of which were deposited on or before the 30th November, 1863.

Notes.

Submarine Cable for the Italian Government.—A submarine cable for this government is now in the course of manufacture at the works of Mr. J. W. Henley, North Woolwich. It is to be submerged between Ottrante and Avalona, and is to be sixty-two miles in length.

Telegraphy.—There are now not less than 10,000 telegraphic stations in Europe for the receipt and despatch of messages; in India, 160; in Australia, viz., Queensland, 6; New South Wales, 35; Victoria, 44; South Australia, 21.

The Metropolitan Board of Works.—The receipts of the Board during the year 1863 were £1,125,116; payments during the same period £1,115,610.

Laying on Heat.—An American paper states that a scheme is under consideration for warming houses from a central source, and supplying the inhabitants of a town with heat as gas now is supplied. Professor Cotta, of Freiberg (Saxony), some years since, proposed plans for this purpose.

Ancient Exhibitions.—In a work lately published on Egyptian Chronology, by Hekekyan Bey, a learned Egyptian civil engineer, speaking of Cœechos, one of the first dynasty of seventeen Thinite kings, and who, he states, reigned for 39 years over Egypt, from 5350 to 3511 years before Christ, he says, "Under him the Egyptians instituted universal exhibitions of cattle, in which the state awarded honours and emoluments on those who competed with success in producing by art cattle possessing certain required qualities and natural marks. It is probable that an Apis period was a cycle of twenty-five Egyptian civil years of 365 days, and that it was established during the second year of the reign of the king in B.C. 5349·44, the competition for oxen taking place in Memphis. The Mnevis period was a cycle of 25 lunar years of 354 days, and will have been established during the third year of the reign of the king in B.C. 5348·117, when the first exhibition of kine was held in Heliopolis. But the Tragian periods were cycles of 25 sacred years of 360 days, the first being established in the seventh year of the reign of the king in B.C. 5342·778, the periodical exhibitions of goats being held in Mendes."

Bhore Ghaut Incline.—The Bombay Presidency is cut off from the rest of India by a range of the Syhadree Mountains, a volcanic scarp, which, rising on the Bombay side to the height of 2,100 feet, has no corresponding depression on the other side, simply subsiding gradually into the general level of the country. A railway over these heights has lately been opened. In the course of a journey of less than one hour, and 15½ miles long, the traveller ascends to a height of 1,832 feet, and the incline is said to be the greatest in the world. In the Bhore Ghaut Railway incline the steepest gradient is 1 in 37, and the lowest 1 in 330, the average being about 1 in 48. There are in all about twenty-six tunnels, the shortest being 29 yards, and the longest 437, and they have been mostly cut in trap rock. The Giovi incline, on the Turin and Genoa Railway, and the Semmering incline, on the Venice and Trieste line, can alone be compared with it, and their dimensions are respectively in length 6 and 13½ miles; in ascents 889 and 1,325 feet; average gradients 1 in 36 and 47; the lengths of tunnelling in the above are respectively, in miles, 2·55, 2·66, and in the Indian line 2·26.

National Monument to Shakespeare.—A member of the Shakespeare Committee suggests Primrose-hill as a site for this monument. He says that for this object the most imposing elevation should be sought—not only in regard to present but to future London, apart, if possible from all other monuments, upon some isolated site, visible at the greatest distance to the greatest number, and that Primrose-hill offers a site 207 feet above the river Thames, recommending itself not alone as the highest base on which to raise a monumental pile, but one that with but slight adaptation could be made to form a grand feature of metropolitan improvement, by uniting the West end with Hampstead. A fine promenade could be formed in a direct line with Regent-street and Portland-place, and could be constructed to the foot of the memorial without violation of public or private rights.

Iron-Clad Ships.—The official reports of the commanders of the "Monitors," made immediately after the failure of the attack upon Fort Sumter in April last, tend to show that these vessels were incapable of resisting the concentrated fire of heavy rifled ordnance. Captain Drayton, of the *Passaic*, says:—"I was struck in quick succession in the lower part of the turret by two heavy shots, which bulged in its plates and beams, and forcing together the rails on which the carriage of the 11-inch gun worked, rendered it wholly useless for the remainder of the action; a little after a very heavy rifle-shot struck the upper edge of the turret, broke all of its eleven plates, and then glancing upwards struck the pilot-house with such force as to send it over, open the plates, and squeeze out the top, exposing the inside of the pilot-house, and rendering it extremely likely that the next shot would take off the top entirely." Captain Rogers, of the *Weehawken*, reports:—"Two or three heavy shots struck the side armour near the same place. They so broke the iron that it only remained in splintered fragments, much of which could be picked off by hand, and the wood was exposed. The deck was pierced so as to make a hole, through which water ran into the vessel; 36 bolts were broken in the turret and a great many in the pilot-house. To the *Patapsco* no damage was done which disabled her, although injuries which she received, if multiplied, would do so. Forty bolts in the funnel were broken. After the third shot from the 15-inch gun of the *Nantuck* a port stopper became jammed, several shots striking very near the port and driving in the plating. It was not used again. A number of the same plates were started so much that another shot in the vicinity would have knocked them off. The deck plates were cut in 12 places; one shot cut through the iron, and about two inches into the beam, starting the plates, several bolts, and the planking, for some feet below. The plates on the side armour of the *Nahant* were badly broken in several places, and one, where struck by two shots in close proximity, partly stripped from the wood, and the wood backing broken in, with edging of back plates started up and rolled back in places. The deck was struck twice damagingly, one shot near the propeller wheel quite shattering and tearing the plate in its passage, and starting up 25 bolts, another starting plates and 20 bolts in the turret. There were marks of nine shots; 56 of the bolts were broken perceptibly, the heads flying off inside the turret, and the bolts starting almost their length outside, some of them flying out completely, and being found at a considerable

distance from the turret, on the deck. One shot struck the upper part of the turret, breaking through every plate. The pilot-house was much damaged, and four more such shots as it received would have demolished it. One shot at the base broke every plate through, and evidently nearly penetrated it."

Correspondence.

ON LOCOMOTION BY HYDRAULIC POWER, AND PROPOSALS FOR METROPOLITAN RAILWAYS.

SIR,—As metropolitan railways are now a general subject for discussion will you allow me to bring forward in your columns two propositions which I believe are original, and can be taken for what they are worth either separate or combined. I do not wish to lay claim to what does not belong to me, and would say at once that the scheme brought forward by Messrs. Hawthorn, at the Newcastle meeting of the British Association, suggested to me the plan of propulsion by hydraulic engines that I am about to describe. Their paper was published in your *Journal* (Vol. XI., page 718): they propose to work trains, where locomotives are objectionable (as in underground railways), by fixed steam engines working a continuous series of wheels by endless wire ropes; these wheels to be erected in the centre of each line of rails and about level with the bottoms of the carriages; under the centre of each carriage, extending its whole length, would be a flat bar, which, pressing on these moving wheels, would thus propel the carriage. Important objections presented themselves to me at once, on examining the model shewn at Newcastle, particularly the great amount of friction in working these endless wire ropes, and the enormous loss of power, as all the wheels in connection with each engine would be moving simultaneously, although very few of them (only those actually under the train) would be doing work. Thus, supposing there were a fixed engine at each mile, each engine would have connected with it a mile of wheels, and whenever any of these wheels were in use, the whole mile of wheels would be running simultaneously, the greater part of them having nothing to do but make a noise, as in the first days of the Blackwall railway. It has occurred to me that it would be far better to use hydraulic power to give motion to the wheels, as thus not only an enormous deal of friction would be saved, but also those wheels only actually required would be in motion; each steam engine would thus only have to impart power to move three or four wheels at a time, instead of the whole series connected with it.

This is my first proposal, to have fixed steam engines at convenient distances, whose work would be to pump water into hydraulic accumulators, and it would probably be found best to have several accumulators connected with each steam-engine; this water power under pressure would be conveyed in pipes along the railway; at proper distances wheels, as in Messrs. Hawthorn's plan, must be placed, but instead of wire ropes each set of wheels must have connected with it a small hydraulic engine, or, where two lines of rail were used, it might be placed between the two; the train, while progressing, would turn on and off the water as required, and thus no useless power would be expended.

Not being a practical engineer, I have felt some hesitation in bringing forward this plan, but I have been encouraged to do so by some engineers, among whom are men whose names would command attention and respect.

It has occurred to me that, possibly, this plan may be more practicable and economical than the atmospheric railway, and thus be capable of more general extension than merely where locomotives are ineligible; this I must leave to the verdict of practical men.

My second proposal depends, to some extent, on my first. It is nothing new to propose railways running by the sides of the streets, about the level of the first floor windows. Some years since the *Illustrated London News* published views of some fine (proposed) streets in London with such railways, but as yet no such plan has been carried out. It has, however, occurred to me that, supposing by the means I have just described, or by some other plan, trains can be propelled without being preceded by heavy locomotives, railways for passengers might with perfect safety be made much lighter, and for town-passenger traffic a narrower than the present English narrow gauge might be used. In some places—for instance, South America—I have understood that a much narrower gauge is in operation. This can be done with more safety where it is proposed, as in this case, to adopt precautions for keeping the carriages on the line. In the proposal before alluded to, it was suggested to have a railway each side of the street, supported on something similar to the original arcades in the Quadrant, but this would considerably contract the street and darken the houses. I propose to carry, through certain wide streets, railways contained in and on tubular viaducts, with open latticed sides and bottoms, so as not to obstruct the light and air; these tubular viaducts to be supported on iron arches, one pillar of these arches to be in a line with the curbstones of the street pavement, and the other against the houses; the tubular viaduct would project a little over the outside pillar, and only containing one narrow line of rails, there would be some considerable space between it and the houses. There would thus be no obstruction either to the foot or carriage traffic, and very slight obstruction to the light and air; one line of rail would be inside the tube and one on the top; of course at the termini arrangements would be made for the transfer of the carriages from one line to the other. The only prominent objection to this plan of constructing railways would be the obstruction to the view, but as the proposal contemplates chiefly suburban railways, to a great extent they would be in roads where gardens are in front of the houses, and when approaching business quarters, the open lattice iron work, which would be some feet from the windows, could certainly be made as agreeable to the eye as the dingy show of bricks and windows on the opposite side of the street. As an instance where such a railway might be eligible, there is a very large omnibus traffic from Camden Town to Oxford-street, where High-street and Tottenham-court-road are business thoroughfares, and such a viaduct would certainly not mar the prospect from the first floor windows. Nearly the whole of the rest of this line the railroad would be a considerable distance from the houses, and in one direction for some distance the hydraulic engines might be dispensed with, as the incline would be sufficient for the train to proceed by itself.

There are some collateral and very important uses to which these viaducts might be usefully applied; the pneumatic dispatch scheme is no doubt a success, the only difficulty is in laying the tubes under some of the streets. Tubes for the purpose could be carried on or under these viaducts with little additional expense, and should the hydraulic plan be adopted, in the case of fires there would always be at hand a supply of water under pressure with ample steam-power at command, which might thus supersede fire-engines everywhere within easy reach of such railways.—I am, &c., W. SYMONS.

17, St. Mark's-crescent, Regent's-park, N.W.

ART-WORKMEN AND THE ROYAL ACADEMY.

SIR,—At the outset of my remarks, I feel greatly puzzled in adopting the modern nomenclature of art, we having, within the last twenty years, taken from the Teutonic so many compound words that not alone confound artists but mistify the masses, who hear of "High-art," "Pure art," "Practical art," "Art-manufactures," and "Art-workmen," as if all art was not "high," "pure," or "practical," and every artist not an art-workman. However, as "word-painting" is a popular produce, a sign of the times, we must take it for what it means rather than what it says.

Germany, certainly, is full of skilled artisans or "art-workmen," capable of carrying out ideas and re-producing forms of a more sterling quality than perhaps those of France, though not with that elegant *abandon*, dash, or appreciation of colour, so common in the productions of their Gallic neighbours (which for certain qualities will always bear the palm), though it is remarkable how choice wares from Austria and Prussia are making their way in various markets, and principally from the taste displayed in their construction or ornamentation.

Now, though it is of the greatest importance that artizans should receive aid in art-education, it seems strange that the Royal Academy Commission should seriously have advised a plan for connecting them with that institution, when the State has an organisation well adapted to the purpose, and quite capable of carrying it out, by means of the local Schools of Art and their officers.

In their laudable wish to do justice in the broad field ot art, the Royal Commission have shown over-zeal for a department hardly within their province, and one being worked out by the Society of Arts, who in a late exhibition of competitive examples of art-workmanship, have fully demonstrated a great national want—a want that should be worked out in the great seats of manufacture, and that by the Department of Science and Art.

Let the Royal Academy by all means extend its influence and fostering care to every department of creative art; let it do all it can for the artist, encouraging him to bestow his genius upon everything, for the higher the power the more universal will the range become; whilst dreaming of the substance do not forget the atoms of which it is composed. All that regards Art in its creative sense appertains to an academy, and every method by which it may be perpetuated—engraving, die-sinking, and enamel painting, being the chief of these. The tardy justice paid by painters to the means by which their popularity could be made patent to the world, is a fact no stranger can comprehend, foreigners well knowing that if a man capable of ennobling a higher walk by his works, descends to a lower (or a different one) he becomes a benefactor, and, as one of a corporation, deserves the highest honours it can bestow.

Upon perusing "the instrument" or document of foundation of the Royal Academy of Arts, in 1768, one cannot but feel that its compilers, had they lived in 1868, would have been as liberal as they were enlightened a century ago, when taste, if it had not sunk to its lowest, was gradually descending; by taste I allude to the effect of Art upon the manners of the nation, which then was to be counted as little, style being nowhere.

When the promoters of the Royal Academy first worked, the Elgin Marbles were in Athens, and other collections now in the British Museum unknown; the monuments of Egypt, Greece, and Rome were unmeasured and unfigured, Nineveh and Pompeii lying buried beneath heaps of ashes, the glories of mediæval-art being, in derision, voted "Gothic;" archæology had little to do with historical painting, nor was geology thought of with regard to landscape, or the glorious forms and colours in Eastern Art ever dreamed of; electricity had not given us the electrotype, nor had lithographic stones been quarried; xylography was not revived, whilst photography, the last great inheritance for Art, was deep in the future; and as to International Exhibitions in palaces of glass, they only existed in the imagery of poets.

Earnestly is it to be hoped that the Royal Academy of Arts will not forget its high mission, for assuredly in seeking to do good to Art and artists, it will confer great benefits upon itself. The Society of Arts (an older institution and pioneer in the field) some twenty years since awakened from the lethargy of a century; the good it has effected needs no record here, for it is world-wide.

I am, &c., JOHN LEIGHTON.

Erratum.—In last number, p. 114, col. 2, line 5 from bottom, for "flax" read "wool."

MEETINGS FOR THE ENSUING WEEK.

Mon. ...R. Geographical, 8½. 1. Capt. Edwin Austin, "Mustakh Glacier." 2. Mr. E. H. Hargraves, "Report on the non-auriferous Character of West Australia."
Medical, 8½. 1. Dr. Palfrey, "A Case of Uterine Polypus, unaccompanied by Hæmorrhage." 2. Mr. W. Miller, "On two peculiar Properties of Chloroform, independent of Anæsthesia." 3. Dr. Habershon, "Abscess of the Liver."

Tues. ...Syro-Egyptian, 7½. Mr. Samuel Sharpe, "Manetho's Lists of Kings explained by the help of Eratosthenes and the Tables of Abydos."
Ethnological, 8. 1. Rev. G. R. Hall, "On the British God Mogon and the Religion of the Northumbrian Celts." 2. Mr. C. R. Markham, "On the Tribes inhabiting the Valley of the Amazons and its Tributaries."
Civil Engineers, 8. 1. Mr. J. R. McClean, President, "Address." 2. Mr. J. M. Heppel, "On the Closing of Reclamation Banks."
Statistical, 8.
Zoological, 9.

Wed. ...Microscopical, 8.
British Archæological Assoc., 8½. 1. Mr. Wentworth, "On Wakefield and Sandal Castle." 2. Rev. E. Kell, "On the Site of Ancient Southampton." 3. Mr. Syer Cuming, "On the History of Slings."

Thur. ...Antiquaries, 8.
Linnæan, 8.
Royal, 8½.
R. Society Club, 6.

Fri.......Philological, 8.

Patents.

From Commissioners of Patents Journal, January 1st.

(Agriculture) harrows, ploughs, &c.—3223—J. Green.
Batteries—3249—J. Mathew.
Bayonet blades, &c., forging and tempering—3251—G. T. Bousfield.
Breech-loading fire-arms—3185—R. Marrison.
Brick machinery—3199—H. Clayton.
Cabs, &c.—3245—R. Walter.
Candles, fixing upright—3247—W. E. Gedge.
Cases for jewels, &c.—3187—C. Jeffreys.
Envelopes, &c.—3227—J. L. Wittenberg.
Forge hammers—3189—J. Astbury.
Fulling machinery—3149—G. T. Bousfield.
Hops, training—3205—F. W. Collins.
Horses, method of stopping—2900—A. B. Florest.
Iron and steel manufacture—3213—W. H. Tooth.
Iron welded chain, &c., manufacture of—3217—E. Tangye.
Looms—3203—T. Goldie.
Looms—3241—A. Turner.
Looms—3255—W. Holland.
Lozenge manufacture—3155—S. and T. Smith.
Oil for mixing paints, &c.—3207—G. Haseltine.
Perforating machines—2496—J. Heap.
Petroleum, &c., stills for—2899—A. G. Southby.
Pumps—3237—F. Hazeldine.
Rag machine cylinder—3113—A. Reid and G. Rydill.
Railway trains, communication between guard and engine driver—3235—J. G. Rowe.
Railways, atmospheric—3191—A. Alison and J. Halliwell.
Screw propeller—3121—W. Livingstone.
Ships, propelling and steering—2780—A. A. L. P. Cochrane.
Smoking pipes—2622—A. Wardle and J. Brindley.
Spring mattresses—3229—V. B. FitzGibbon.
Steam engines—3219—R. Paterson.
Stockings, darning, &c.—3221—R. Baynes.
Surface condensers—2566—W. Snell.

From Commissioners of Patents Journal, January 5th.

Patents on which the Stamp Duty of £50 has been paid.

3193. B. N. de Buffon.
3. M. Henry.
107. J. H. Johnson.
85. W. G. Woodcock.
20. T. Cobley.
14. W. C. Fuller, J. A. Jaques, and J. A. Fanshawe.
25. A. Fairbairn.
84. A. M. Foote.
184. J. Deakin and J. Cresswell.
18. S. Perkes.

Patents on which the Stamp Duty of £100 has been paid.

3089. T. Alden.
284. J. Owen.
3102. W. Bray.
12. J. Fowler, jun.
3. W. Rigby.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, JANUARY 15, 1864. [No. 582. Vol. XII.

Announcements by the Council.

SWINEY BEQUEST.

A meeting of the judges appointed under the will of the late Dr. Swiney is hereby summoned to be held on Wednesday, the 20th of January instant (being the anniversaryof his death), when the bequest under the said will, in favour of the "author of the best published Treatise on Jurisprudence," will be adjudged. The meeting will take place at the House of the Society of Arts, at five o'clock, p.m.

(By order) P. LE NEVE FOSTER, *Secretary.*

13th January, 1864.

DENTON PRIZES.—COTTAGES FOR THE LABOURING CLASSES.

One hundred and seven designs for cottages have been sent in, in competition for the two prizes of £25 each, placed in the hands of the Council by J. Bailey Denton, Esq., and offered for the most approved designs for cottages to be built singly or in pairs, at a cost not exceeding £100 each. It will be remembered that one prize was to be competed for by members of the Architectural Association, and the other to be open to general competition. The latest date fixed for the reception of the designs was the 1st inst.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

JAN. 20.—"On the injurious effects of smoke on Building Stones and on Vegetation." By Dr. A. VOELCKER.

JAN. 27.—"On the Metric System of Weights and Measures, and its Proposed Adoption in this Country." By SAMUEL BROWN, Esq., F.I.A., F.S.S.

FEB. 3.—"On Instantaneous Engraving upon Metal." By Mons. E. VIAL (illustrated with experiments).

FEB. 10.—"On Fresco Painting, as a suitable mode of Mural Decoration." By J. BEAVINGTON ATKINSON, Esq.

CANTOR LECTURES.

Courses of Lectures on the following subjects will be delivered during the Session:—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. HASTINGS, Esq., Barrister-at-Law.

Fine Arts Applied to Industry. By W. BURGES, Esq.

Chemistry Applied to the Arts. By Dr. F. CRACE CALVERT, F.R.S.

The third and fourth lectures of Mr. Hastings' course will be delivered on Mondays, the 25th January and 1st February, at 8 o'clock; the subjects will be as follows:—

Contraband; its Nature and Usages.

Capture of Private Property at Sea; present State of the Law as modified by the Declaration of Paris; Arguments for and against its Continuance.

The Foreign Enlistment Act; its Operation on Commerce.

REPORTS OF THE JURIES.

The complete volume of the Reports of the Juries on the Exhibition of 1862 is now ready, and is in course of issue to subscribers.

PRIZES TO ART-WORKMEN.

The works rewarded by the Society of Arts and for which prizes have been given, have been placed, by permission of the Lords of the Committee of Council on Education, in the South Kensington Museum, and will be found in the Gallery of the Iron Museum, at the entrance to the Sheepshanks Gallery.

NOTICE TO INSTITUTIONS.

The Department of Science and Art have placed at the disposal of the Council the requisite number of copies of their Official Calendar for 1864, for distribution to the Institutions in Union, and they will accordingly be issued shortly.

The Christmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of Institutions.

BARNSLEY MECHANICS' INSTITUTE.—A lecture was recently delivered here by the Rev. G. Mather, of Leeds. There was an overflowing audience. The subject was, "The Intellectual Powers Unfolded and Illustrated."

LANCASHIRE AND CHESHIRE ASSOCIATION.—A meeting of teachers certificated by the Science and Art Department of the Committee of Council on Education, was held on

the 30th ult. at the Manchester Mechanics' Institution, to confer with the Council of the above Association. There were about 30 delegates present. Mr. Alderman Wilkinson, of Burnley, presided.—Dr. Pankhurst, hon. sec. to the association, stated that the objects of the conference were to consider the best means of distributing the labours of the certificated teachers at present employed, and of increasing their numbers. Also it was advisable to consider how to deal with some difficulties felt as to the mode of conducting science classes in some localities, and whether districts adopting science teaching should not contribute towards its support in addition to the money granted by government.—With reference to the first of the questions named by Dr. Pankhurst, Mr. Traice, of Bolton, said the chief difficulty was to get pupils. There were at present 300 certificated science teachers, well qualified, but only about 50 were already employed.—It was resolved that the council of the association be requested to prepare and publish a complete list of teachers, with their subjects and terms, and the districts within which each teacher is willing to be engaged. A resolution was also passed to the effect, that the department of Science and Art be requested to rescind the clause which prohibits elementary teachers, who have pupil teachers under their charge, from acting as teachers of science classes, by refusing to admit them to payment on results, as it was felt that the rescinding of the clause, and the establishment of itinerant teachers, would be likely materially to assist smaller institutions and evening classes.

Marlborough Reading and Mutual Improvement Society.—A lecture was recently given by Dr. J. C. Daniel, on "Napoleon's Campaign in Russia."

Middlesborough Mechanics' Institute.—The annual social reading on behalf of this Institute took place at the Odd Fellows' Hall, on Monday evening, the 4th instant. Isaac Wilson, Esq., occupying the chair. Mr. N. Dawes gave an original essay on "The Iron Horse" (the steam engine). Mr. Wm. Taylor gave a comic reading, "How Ben Brust spent his Sovereign," and "The Death of Little Nell" (from Dicken's "Old Curiosity Shop"), was read by the Mayor. An amusing recitation, "The Ambitious Amateur Actor," was given by Mr. Adams. A reading, "The Gridiron," or "Paddy Malony's Travels in France," was given by Mr. G. F. Boddington. Several songs were also sung, and the evening was brought to a close by the company singing "God save the Queen," and returning a vote of thanks to the performers.

Newport Athenæum and Mechanics' Institute.—The directors have issued the first number of a journal, to be continued monthly. They have been encouraged to this step by the success which has attended similar enterprises in connexion with Mechanics' Institutes in various part of the country. The journal contains questions in various historical and other subjects, to which answers are invited, and particulars of entertainments and lectures are given. The only class in connexion with the Institution is the elocution and discussion class, which was instituted in October, 1862. It assembles on Monday evenings, and the exercises are varied, viz., speeches (prepared and extempore), essays, readings, recitations, and discussions. The several exercises are open to the criticism of the class. The directors, desirous of affording to the class that encouragement which it deserves, resolved at a recent meeting to give the sum of £1 as a prize for the best essay, to be written by a member of the class, on "Self-Education." Other prizes will be given for the essays which, in the opinion of the adjudicators, shall rank second and third. Sir Thos. Phillips, the Rev. S. Fox, and Mr. W. Christophers, have been named as adjudicators.

Oldham Lyceum.—On the 19th Dec. the annual tea-party in connexion with the Lyceum was held in the class-rooms of the Institution, and was attended by about 350 persons. After tea, a meeting was held in the Town-hall, for the purpose of distributing the prizes to the successful candidates in the recent examinations. The chair was occupied by the Rev. R. M. Davies. The chairman said he could sincerely congratulate them, looking at the history of the past year. The library had received very considerable additions. With regard to the classes, at no time were they more healthy than now. In the female department, the report by the female examiners was most creditable to the teachers and pupils. The free-hand drawing-class, under Mr. Potter, was admirably conducted. In relation to mechanical drawing, Mr. Taylor, the teacher, kept up a goodly class, and the directors were anxious to make that department as successful as possible. The French class was not numerously but well attended. The Latin class was small, but regularly instructed. The certificates and prizes granted by the Society of Arts, and also those awarded at the local examinations, were then distributed. The meeting was addressed by James Platt, Esq., and other gentlemen.

SCIENCE AND ART DEPARTMENT.—RESULTS OF THE EXAMINATION FOR TEACHERS' CERTIFICATES, NOV. 1863.

The following list will be found useful to Institutions requiring science teachers:—

Group I.—Practical, Plane, and Descriptive Geometry, Mechanical and Machine Drawing, and Building Construction.

Subject 1. Practical, Plane, and Descriptive Geometry.—1st Grade Certificate: Charles F. Dorrell, 2, Chandos-street, Covent-garden, London; Arthur J. Mayne, 39, Upper Wellington-street, Dublin; James Mellor, Science School, Oldham; John Kennedy, School of Art, Dundee; Charles H. Rule, Training College, Cheltenham; Joseph Willcock, 24, Market-place, Manchester. 2nd Grade Certificate: William Burns, Dr. Burns's School, Rochester; Henry B. Dorrell, Wellington-road, Slough; Edmund C. Plant, Normal College, Cheltenham; John Sargeant, Church-street, Slough; James Stevenson, Clark-street School, Kilmarnock; William Stone, Ralliff-street, Wolverton. 3rd Grade Certificate: Washington Hudson, Mechanics' Institution, Stockport. Eight failed.

Subject 2. Mechanical and Machine Drawing.—1st Grade Certificate: Washington Hudson, Mechanics' Institution, Stockport; Daniel Pidgeon, Banbury; Joseph Willcock, 24, Market-place, Manchester. 3rd Grade Certificate: James M'Rae, Kirton-holm, Kilmarnock; James Mellor, Science School, Oldham; Fred. H. C. Sammons, 11, Devonshire-road, Liverpool; Samuel Taylor, 5, Havelock-terrace, Brook's bar, Manchester. Four failed.

Subject 3. Building Construction.—1st Grade Certificate: Gilbert R. Redgrave, 18, Hyde-park-gate South, Kensington, London; Frank D. Wakeford, 12, Ann's-terrace, Walham-green, London. 2nd Grade Certificate: James Mellor, Science School, Oldham; Samuel Taylor, 5, Havelock-terrace, Brook's-bar, Manchester; Joseph Willcock, 24, Market-place, Manchester. 3rd Grade Certificate: Henry B. Dorrell, Wellington-road, Slough; Washington Hudson, Mechanics' Institution, Stockport; John Sargeant, Church-street, Slough. One failed.

Group II.—Mechanical Physics.

Subject 1. Theoretical Mechanics —1st Grade Certificate: Edward H. Birkenhead, Mining School, Wigan; George Gates, St. Mark's College, Chelsea, London. 2nd Grade Certificate: Richard Jones, St. Mark's College, Chelsea, London; Robert Stroud, ditto; John E. Whitehead, ditto. 3rd Grade Certificate: John Bryant, St. Mark's College, Chelsea, London; Edwin Hurst, ditto. One failed.

Subject 2. Applied Mechanics.—2nd Grade Certificate: Richard Strachan, Sailors' Home, Poplar, London. 3rd Grade Certificate: James M'Rae, Kirton-holm, Kilmarnock; James D. Thomas, 3, Colleton-buildings, Exeter. Two failed.

Group III.—Experimental Physics.

Subject 1. Acoustics, Light, and Heat.—1st Grade Certificate: Joshua J. Doherty, Model National School, Belfast; William Gunn, National School, Newtown, Montgomeryshire; George J. Snelus, Christ Church School, Macclesfield; Charles J. Woodward, Midland Institute, Birmingham. 2nd Grade Certificate: John Angel, Mechanics' Institution, Manchester; Edward Bowen, Science School, Liverpool; John Collins, Cathedral School, Manchester; William H. Greer, National Model School, Newtownards; James J. Kelly, Parish School, Gladsmuir, East Lothian; Henry A. Reatchlous, Training College, Westminster, London; James H. Webster, ditto; Edmond Wren, Model School, Ballymena. 3rd Grade Certificate: John Beatty, Endowed School, Oldcastle, County Meath, Ireland; William Cooper, National School, Tintwistle, Manchester; John S. Holden, Holywood, Belfast; Evan H. Rowland, National School, Llanferres, Mold. Three failed.

Subject 2. Magnetism and Electricity.—1st Grade Certificate: Joshua J. Doherty, National Model School, Belfast; George J. Snelus, Christchurch, Macclesfield; and Alfred P. Wire, National School, Little Baddow, Chelmsford. 2nd Grade Certificate: Thomas Beesley, 5, High-street, Banbury; Edward Bowen, Science School, Liverpool; William Burns, 8, Newton-terrace, Rochester; John Collins, Cathedral School, Manchester; Joseph Craven, Parish School, Stavelay, Chesterfield; William H. Greer, National Model School, Newtownards, Ireland; William Gunn, National School, Newton, Montgomeryshire; John S. Holden, Holywood, Belfast; Leopold C. Rückert, Union-street, Oldham; Charles J. Woodward, Midland Institute, Birmingham. 3rd Grade Certificate: John Beatty, Endowed School, Oldcastle, county Meath, Ireland; John Howard, Public School, Lower-road, Islington, London; Isaac Mackrell, Wesleyan School, Dartford; James J. Kelly, Parish School, Gladsmuir, East Lothian; Edmond Wren, Model School, Ballymena, Ireland. One failed.

Group IV.—Chemistry.

Subject 1. Inorganic Chemistry.—1st Grade Certificate: Alfred H. Allen, 14, Fernley-place, Glossop-road, Sheffield; John Angell, Mechanics' Institution, Manchester; Richard Bannister, 7, Coulston-street, Chelsea, London; Charles Estcourt, 28, Halsey-street, Chelsea, London; Joseph Hartley, 39, Bridgewater-street, Manchester; John S. Holden, Holywood, Belfast; John Robertson, Bagshot, Surrey; William T. Rowden, 119, Stanhope-street, London; and John Scott, Grammar School, Loughborough. 2nd Grade Certificate: Jonathan G. Hands, St. Paul's School, Wilton-place, Eaton-square, London; John Howard, Public School, Lower-road, Islington, London; William Judd, Christchurch, Hants; Edward H. M'Millan, National School, Campden, Gloucester; William Rigg, People's College, Nottingham; Andrew Smyth, Endowed School, Oldcastle, county Meath, Ireland; and Richard Trower, Industrial School, Brighton. 3rd Grade Certificate: James J. Kelly, Gladsmuir Parish School, East Lothian, Scotland; and John James Spear, Woodbine-cottage, Newton Vivey-road, Bray, Ireland. One failed.

Subject 2. Organic Chemistry.—1st Grade Certificate: Alfred H. Allen, 14, Fernley-place, Glossop-road, Sheffield; Richard Bannister, 7, Coulson-street, Chelsea, London; and Charles Estcourt, 28, Halsey-street, Chelsea, London. 2nd Grade Certificate: Joseph Hartley, 39, Bridgewater-street. Manchester; John S. Holden, Holywood, Belfast; and Andrew Smyth, Endowed School, Oldcastle, County Meath, Ireland. One failed.

Group V.—Geology and Mineralogy.

Subject 1. Geology.—1st Grade Certificate: Robert Beveridge, 1, Gallowgate, Aberdeen; James Dowling, Model School, Waterford; and Wm. L. Notcutt, 399, High-street, Cheltenham. 3rd Grade Certificate: Alfred Henry Allen, 14, Fernley-place, Sheffield; George C. T. Bartley, Kensington, London; William Prosser, Dean-row British School, Wilmslow, Cheshire; and James Saunders, Alma-street, Luton, Beds. Nine failed.

Subject 2. Mineralogy.—2nd Grade Certificate: Alfred H. Allen, 14, Fernley-place, Sheffield. One failed.

Group VI.—Animal Physiology and Zoology.

Subject 1. Animal Physiology.—1st Grade Certificate: George C. T. Bartley, Kensington, London; Uriah J. Davis, Upton St. Leonards, Gloucester; Alfred Jones, Cross-street Day School, Islington, London; William L. Notcutt, High-street, Cheltenham; Moses Pullen, Free School, Painswick, near Stroud; and Thomas Viccars, British School, Torquay. 2nd Grade Certificate: Richard Bithel, British School, Kingsland, London; Thomas Cribbin, Birkbeck School, Peckham, London; Ellis A. Davidson, School of Art, Chester; Tycho E. Hotchkin, Somerby, near Oakham; and Henry A. Reatchlous, Training College, Westminster, London. 3rd Grade Certificate: Thomas Edwards, Victoria-street, Govan-by-Glasgow; Benjamin Foster, Training College, Westminster, London; Wm. Prosser, Dean-row School, near Wilmslow, Cheshire; and James H. Webster, Training School, Westminster, London. Four failed,

Subject 2. Zoology.—1st Grade Certificate: Alfred Jones, Cross-street School, Islington, London; and Wm. L. Notcutt, 399, High-street, Cheltenham. 2nd Grade Certificate: Richard Bithel, British School, Kingsland, London; Alexander W. A. Finlay, 52, India-place, Edinburgh; and Mrs. Elizabeth Mayer, Secular School, Glasgow. 3rd Grade Certificate: Ellis A. Davidson, School of Art, Chester. Two failed.

Group VII.—Vegetable Physiology, Economic and Systematic Botany.

Subject 1.—Vegetable Physiology and Economic Botany.—1st Grade Certificate: John Collins, Cathedral Schools, Manchester; Uriah J. Davis, Upton St. Leonards, Gloucester; Thomas Jones, Halton, Hastings; Margaret Macornish, Corsock, near Dalbeattie, N.B.; William L. Notcutt, 399, High-street, Cheltenham. 2nd Grade Certificate: John S. Holden, Holywood, Belfast; William Judd, High-street, Christ Church, Hants; Frederick J. A. Leipner, 22, Upper Park street, Clifton; Moses Pullen, Free School, Painswick, near Stroud. 3rd Grade Certificate: Thomas H. Cook. Horsham-road, Dorking; Alexander W. A. Finlay, 52, India-place, Edinburgh; Elizabeth S. L. Jones, Halton, Hastings. Three failed.

Subject 2. Systematic Botany.—1st Grade Certificate: John S. Holden, Holywood, Belfast; William L. Notcutt, 399, High-street, Cheltenham. 2nd Grade Certificate: John Gibbs, Baddow-road, Chelmsford. 3rd Grade Certificate: William Judd, High-street, Christ Church, Hants; Frederick J. A. Leipner, 22, Upper Park-street, Bristol. One failed.

Group VIII.—Mining and Metallurgy.

Subject 1. Mining.—1st Grade Certificate: Mark Fryer, Andersonion University, Glasgow. 3rd Grade Certificate: Robert Muir, Auchinheath, N.B.

Subject 2. Metallurgy.—2nd Grade Certificate: John Angell, Mechanics' Institution, Manchester; Henry P. Meaden, East Lancashire Union of Institutes, Haslingden. 3rd Grade Certificate: George J. Snelus, Christ Church, Macclesfield.

Navigation.

Subject 1. Mathematics.—1st Grade Certificate: Samuel Crawley, Proprietary School, Hereford; Arthur J. Gayne, Trade School, Bristol. One failed.

Subject 2. General Navigation.—1st Grade Certificate: Arthur J. Gayne, Trade School, Bristol. 2nd Grade Certificate: Samuel Crawley, Proprietary School, Hereford.

Subject 3. Nautical Astronomy.—1st Grade Certificate: Arthur J. Gayne, Trade School, Bristol.

SUBJECT 4. PHYSICAL GEOGRAPHY.—2nd Grade Certificate: Arthur J. Gayne, Trade School, Bristol. 3rd Grade Certificate: Samuel Crawley, Proprietary School, Hereford. One failed.

SUBJECT 5. STEAM.—2nd Grade Certificate: Harry Evers, Charles' National School, Plymouth; John Merrifield, Navigation School, Plymouth; Richard Strachan, Navigation School, Poplar. 3rd Class: J. M'Rae, Kirtonholm, Kilmarnock.

PRELIMINARY HIGHER MATHEMATICS.—3rd Grade Certificate: Samuel Crawley, Proprietary School, Hereford.

BUILDING STONES.

The following memorandum of the results of examination into the comparative qualities and fitness for building purposes of samples of stone from different quarries in the Island of Portland, was drawn up for the Inspector General of Fortifications, by F. A. Abel, F.R.S., Chemist of the War Department, and contains information likely to be useful to all interested in building:—

A collection of twenty-eight specimens, representing the stone obtained from different quarries and beds on the Island of Portland, has been submitted:—1. To a careful comparative inspection. 2. To experiments, having for their object the attainment of comparative data, regarding (*a*) the chemical composition of the stones; (*b*) their strength and power of resisting wear from mechanical causes; (*c*) their porosity, or absorbent power, and consequent susceptibility to the destructive effects, mechanical and chemical, of atmospheric agents. As regards chemical composition, the differences, indicated by the analysis of the specimens of stone from different quarries, are only of a trifling description, and not calculated to influence in any definite manner the comparative durability of the different varieties of stone. The properties which it is considered should, apart from the questions of chemical composition and facility of working in the mason's hands, be combined in a building-stone, capable of resisting effectually the fullest exposure to atmospheric influences, are, (1) compactness of structure or a low degree of porosity; (2) strength and hardness (to the greatest extent compatible with the working of the stone); (3) uniformity of structure.

The results of the experiments show that all the superior descriptions of "Whit-bed" stone combine strength and compactness in a considerably higher degree than the varieties of "Base-bed" stone. Some kinds of the "Whit-bed" stone, however (*i.e.*, those from the New Maggot and Inmosthay Quarries), though ranking with the best as regards strength, exhibit a greater degree of porosity. Again, other "Whit-bed" stones (from Old Maggot, Waycroft, and Independent Quarries) exhibit but little superiority, in point either of strength or compactness, over the generality of the "Base-bed" stones;

TABLE SHOWING THE COMPARATIVE ORDERS OF STRENGTH AND COMPACTNESS OF SAMPLES OF STONE FROM DIFFERENT QUARRIES IN THE ISLAND OF PORTLAND.

Description of Stone.	Order of Compactness.	Order of Strength.	Peculiar Features of each Stone.
ROACH.			
War Department, Vern Hill Quarry	One.*	One.	Light coloured, very hard and compact, one of the heaviest stones of the series; its weight being very much greater than that of the Roach from Independent Quarry. Its strength is not uniform, as it contains numerous shells and cavities.
ROUGH WHIT-BED.			
Admiralty Quarry, Quarried recently	Two.*	Two.	Rough, but compact; contains numerous small shells.
,, ,, Do. last autumn.	Two.*	One.	Containing only few cavities.
,, ,, Do. 3 years ago	Between six and seven.	Between four & five.	Very rough and irregular, containing large shells; differing, therefore, greatly from the other samples from Admiralty Quarry.
War Department Quarry, Vern Hill (Bed not specified, evidently WHIT-BED), Quarried recently	Three.	One.	Hard and very compact; containing, however, some large cavities.
Do. last autumn	Four.	Three.	A very hard light-coloured stone, containing numerous pin-hole cavities.
Do. 3 years ago	Four.	Three.	Similar to No. 1 from this quarry, though somewhat less compact, apparently free from cavities.
WHIT-BED.			
Admiralty Quarry, Quarried recently	Four.	Three.	All these samples very similar. Light-coloured compact stones, containing a few small shells. Apparently free from cavities.
,, ,, Do. last autumn	Four.	Three.	
,, ,, Do. 3 years ago	Four.	Two.	
Inmosthay Quarry	Six.	One.	Fine grain, moderately compact, almost destitute of shells; one of the most uniform of the Whit-bed series.
New Maggot Quarry	Five.	Two.	Light coloured, compact, and very uniform.
BASE-BED.			
Admiralty Quarry, Quarried recently	Four.	Three.	Nos. 1 and 3 are similar: light-coloured, compact, and very uniform. No. 2 is somewhat darker, and exhibits patches of closer texture. They exhibit more indications of shells than any other Base-bed stones; and are, in appearance and properties, very similar indeed to Whit-bed stone.
,, ,, Do. last autumn		Two.	
,, ,, Do. 3 years ago		Two.	
WHIT-BED.			
Old Maggot Quarry, Marked I T	Between six and seven.	Four.	Nos. 1 and 3 are much rougher in texture than No. 2, which is a little superior to them in compactness, but is somewhat less uniform.
,, ,, ,, L I	Six.	Three.	
,, ,, ,, I E	Between six and seven.	Four.	
Waycroft Quarry	Seven.	Four.	Rough in texture and porous.
Independent Quarry	Between seven & eight.	Four.	Fine grained but porous.
BASE-BED.			
Old Maggot Quarry, Marked I T	Seven.	Three.	I T is uniform, but I E exhibits faint bands of stratification. L I is about the lowest quality of Base-bed stone examined. It is very soft and porous.
,, ,, ,, I E	Seven.	Five.	
,, ,, ,, L I	Ten.	Six.	
Waycroft Quarry	Eight.	Four.	Light-coloured and uniform.
Inmosthay Quarry	Eight.	Four.	Exhibits considerable want of uniformity.
New Maggot Quarry	Nine.	Three.	Very uniform; similar to I T Old Maggot Quarry, though more porous.
Independent Quarry	Nine.	Six.	A rough very porous stone, exhibiting considerable difference of strength in different portions; to be ascribed to the fossil markings observed here and there.
ROACH.			
Independent Quarry	...	...	A very inferior description of stone. Full of large loose petrifactions and cavities of considerable size. The strength of the most compact portion was only about half that of the weakest of the above stones.

* The compactness of these is about as high again as those next in order.

and are, indeed, inferior to the best "Base-bed" variety. The "Base-bed" stones are, undoubtedly, more generally uniform in structure than those of the "Whit-bed;" this being mainly due to the comparative freedom of the former from distinct petrifactions. Though such petrifactions were shown, by the results of experiments, to impart, in many instances, great additional strength to the stone, they frequently give rise, by their existence, to cavities, sometimes of considerable size, which not only serve to weaken those particular portions of the stone, but may also, if they exist in proximity to exposed surfaces of a block of stone, promote its partial disintegration by the action of frost. Greater care is therefore unquestionably required in the selection of "Whit-bed" stone than need be employed in the case of all the better varieties of "Base-bed" stone.

Appended to this Memorandum, in a tabular form, is a statement of the comparative strength and compactness of the different varieties of stone, as represented by the specimens experimented upon, together with a description of the peculiarities noted on examination of the specimens, many of which have an important bearing npon the results obtained in the experiments instituted with the blocks.*

The results of these experiments lead to the following conclusions, regarding the comparative merits of the various descriptions of Portland stone in question for building purposes. The Roach stone from "War Department" Quarry is an invaluable stone for external work in localities where very considerable strength and power of resisting mechanical wear are required, *e.g.*, in connection with those portions of work which may become exposed to the continual abrasive action of water. The rough "Whit-bed" stone from Admiralty Quarry (as represented by specimens 1 and 2, see table), is also a highly valuable stone for external work, of a similar kind, where great strength is required, and particularly where the numerous irregularities in the above Roach stone may be objectionable.

The following varieties are all well calculated for external work, and Mr. Abel considers that the order of their relative value is as follows:—

1. Stone from War Department Quarry, Vern Hill; "Whit-bed" stone, Admiralty Quarry. 2. "Whit-bed" stone, New Maggot Quarry; "Base-bed" stone, Admiralty Quarry. (This may be considered quite equal in quality to Whit-bed stone.) "Whit-bed" stone, Inmosthay Quarry. (Particularly adapted from its texture and uniformity for ornamental work.) 3. Whit-bed stone, Old Maggot Quarry. (a.) Marked L I. (b.) Marked I T and I E.

For internal work, the following rank highest, on account of their uniformity and comparative strength:— "Base-bed" stone, Old Maggot I T; "Whit-bed" stone, Independent Quarry; "Base-bed" stone, Waycroft Quarry; "Base-bed" stone, New Maggot Quarry.

The following are inferior to those just named, in texture and uniformity:—"Whit-bed" stone, Waycroft Quarry; "Base-bed" stone, Old Maggot Quarry I E; "Base-bed" stone, Inmosthay Quarry.

The "Base-bed" stone from Old Maggot Quarry marked L I, and that from Independent Quarry, are of low quality, as compared with the remainder; and no reliance can be placed on the durability of the Roach stone from Independent Quarry, judging from the specimen received.

The author observes that no definite conclusion can be drawn, from the comparative properties of the specimens of stone from one and the same locality (quarried at different periods of time), regarding the influence exerted by exposure, after quarrying, upon the quality of the stone. In the instance of the examples of rough "Whit-bed" stones from Admiralty Quarry, the specimen quarried last autumn was decidedly the strongest (that quarried three years ago differed altogether in character from the other specimens). The specimens of "Whit-bed" stone from the Admiralty Quarry were very much alike in strength; there being a slight difference in favour of that quarried three years ago. In the "Base-bed" specimens, from the same quarry, the strength was also found to increase somewhat with the age of the stone; but, of the specimens from the War Department Quarry, the one most recently quarried was considerably stronger than the others. Here again, however, the difference must be ascribed to a difference in structure; the other two specimens (quarried last autumn and three years ago) were in all respects alike. On the whole, the evidence may be considered as a little in favour of the opinion that an improvement in the strength of the stone is effected, to some extent, by seasoning.

* These experiments consisted, chiefly, of careful determinations:—

1.) Of the comparative absorbent power exhibited, under precisely similar conditions, by cubes of the different stones, and

(2.) Of the weight sustained, up to the point of fracture (*i.e.*, the crushing weights), by accurately cut cubes of the stones. Three cubes of each variety of stone were crushed, and the conclusions, as to the comparative strength of the stones, were drawn from the mean results thus arrived at. These crushing experiments were carried out with the well-known American mechanical testing machine.—F. A. A.

Fine Arts.

MULREADY'S WORKS AND SKETCHES.—Messrs. Christie advertise that this sale will take place on the 18th, 19th, and 20th April. It is stated that the exhibition of all his works will be opened at the South Kensington Museum on Thursday, the 17th March.

ELECTROTYPE COPIES OF THE BRONZE GATES OF THE CATHEDRAL AT PISA are being made for the South Kensington Museum. The *Nazione* lately stated positively "that the castings of the beautiful side door of the Cathedral fronting the bell-tower, wrought in bronze by Bonanno, of Pisa, in the 12th century, have recently been spoiled through want of experience of those who have undertaken to make moulds of them in gelatine;" whereupon the responsible official addressed a letter to the editor of *La Nazione*, in answer, as follows:—"The Academy of Fine Arts in Pisa having heard the report of the commission charged to examine the operation of moulding the bronze gates of the Cathedral of Pisa, have solemnly and unanimously declared that no injury whatever has resulted to the bronzes from the operation, and that leave may be safely granted to Sig. Franchi to continue his work upon the plan hitherto pursued, which is declared perfectly harmless to these masterpieces. The undersigned, on whom alone would rest the responsibility of these fancied injuries, has much pleasure in announcing this decision, and requests an immediate insertion of his letter, in respect of the importance of the question.—CARL. GAETANO POGGESI, of the Board of Works of the Cathedral, Pisa."

Manufactures.

INDUSTRIAL ART IN FRANCE AT THE RECENT EXHIBITION IN THE PALAIS DE L'INDUSTRIE.

The following is a translation of some portions of an article in the *Revue des Deux Mondes*, by M. A. de Beaumont:—

Some years ago the superiority of France in industrial art was scarcely a subject of doubt. In this domain, where clever workmanship can only exist corrected and disciplined by a taste for the beautiful, we did not know of any rivals. Even at the Exhibition of 1855 we retained the preference for ingenious inventions and productions of an elegant

kind. And yet, in 1862, a remarkable event took place, French Industrial Art found at the Universal Exhibition of London a rival, an unexpected competitor, nearly a conqueror in British Industrial Art.

How explain this sudden triumph of our neighbours? By what secret had they in five years acquired those rare qualities of which we were so justly proud? Such is the question which those who take an interest in a closer alliance between art and industry in France did not venture to put to themselves a year ago without reasonable anxiety. At the present time this question is renewed, and it would seem that at the Exhibition which has been some time opened at the Champ Elysées, French Industrial Art itself wished, in presence of its new rival, to examine itself as to its real strength, submit to the judgment of the public its newest productions, ascertain what progress has been made in the last few years, and ask itself what remains to be accomplished? This attention to progress in the several branches of Art in which we have hitherto been considered superior, is certainly not to be denied. It testifies to a real feeling of the requirements of our period. We live in an age where positions are easily changed, and where it is necessary (and it is the same with mankind as it is with individuals) in order to secure the position already required, to increase our efforts to keep ourselves always in the right direction. Is it sufficient to know our position, to number with pride the riches we possess, to acknowledge with regret the riches we have lost? Certainly not, and France, one must own, deceives herself rather too much about exhibitions. Exhibitions repeated at short intervals cannot have any very sensible influence on art. Our neighbours proceed with less show but more logic, and here we are recalled to the question which evoked the Exhibition of 1862. That exhibition at least taught us one important fact, which is, that in barely ten years England had nearly surpassed us in applications of art to industry; but the explanation of this great advantage for England is in the part she has taken, not at the exhibitions, but in the study of art itself. These years have not been passed in admiring her own productions, they have been passed in instructing, in strengthening herself by the study of good examples; in a word, by her developing at home instruction in Industrial Art in the most liberal manner.

After the great international gathering inaugurated by the Exhibition of 1851, England felt her inferiority in that sphere of industry which specially applies to Art. A noble spirit, whose memory is justly revered, Prince Albert, pointed out the causes of that inferiority, and took the initiative of those improvements which in ten years have nearly changed the aspect of affairs. England possesses at the present moment 800 or 900 societies, whose mission it is to propagate a feeling for art and taste. These societies number 200,000 members, which in their turn encourage 100 Schools of Art and nearly 300 private industrial schools. Museums of all kinds have been created for each industry, with public instruction and special lectures for the different kinds of manufacture. To this development has been added the purchase of books, drawings, and engravings, which may serve as models and examples. This vast system carries with it a considerable amount of funds, and a body of intelligent men devoted to Art and attached firmly to these institutions by a proper remuneration. We saw in 1862, in London, several specimens of the works of these new industrial schools of Art, and we must acknowledge that if the students are not so clever as those of our schools, they arrive, thanks to the happy choice of models, at an incontestable superiority. Regarding the excellent movement of Schools of Industrial Art which England presents to us, where is France at the present time? The Exhibition of 1862 showed this to us, for there was the happy idea, which deserves to be encouraged, of bringing the schools of the whole country into that industrial competition. It is, therefore, necessary that France should know how to recognise that which England acknowledged to herself ten years ago, that her instruction in Industrial Art requires a complete reformation. The study of nature and the old masters, the only fruitful study which manifests itself in England in such important results, is scarcely found, except very feebly, in the drawings exhibited by the students in the Champs Elysées. The greater part of the drawings exhibited betray a bad method applied to the education of our young industrial artists, who are generally kept in a closed room facing a cast without interest, or before those tortured lithographs the laborious execution of which a child is kept for months studiously endeavouring to imitate. How much time is lost in producing these symmetrical hatchings, which make the pupil forget the object of the design, and even the subject which is being copied. If the students were only surrounded by the elegant and precious objects which ornament the palaces, perhaps their imaginations, awakened by the comparison of the beautiful, would not depart from the laws of taste, but this cold atmosphere of the school or class-room is not calculated to give to youth that pure and elevated taste which the grandeur of divine works of art alone can inspire.

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There is wanting a good system for our schools, and that is the reason why, for the last ten years, our industrial art has seen its ancient prestige decay. This fact established, let us pass from the method of instruction to the works it has produced, and it will be easy to show, by a few characteristic examples what the Exhibition in the Champs Elysées has revealed to us as to the tendencies and as to the efforts of national genius in a sphere in which it has been so accustomed hitherto to triumph.

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There is certainly in the designs for carpets, shawls, lace, and jewellery which cover the walls great cleverness, but artists, engravers, lithographers, carvers, niello-workers and enamellers, all imagine that by attaining in their work the greatest amount of evenness and the uniformity of a machine, they will arrive at perfection. They abandon all expression in their drawing, and consider that they have reached the mark when they have brought their hand to resemble that piece of steel in the machine for pricking and tracing, of which they make too frequent use. What time and pains is taken to bring under control the muscles, to destroy all signs of life, of spirit, in a word, inspiration of the highest art, which is only found in truly eloquent works, if we may so express ourselves, in the works where a generous feeling makes itself felt and destroys their uniformity. That great exactitude which pre-occupies the industrial artist of these days, prevents him from seizing the poetry and the philosophy of his work and consequently loving it. He is only an automaton charged to execute mechanically a drawing which is given him; there his art ceases, and he ignores entirely other processes.

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Passing from the porcelain to the glass, we notice in the first place the productions of Messrs. Dupouchet and Gosse. That which specially characterises this manufacture is the desire to imitate porcelain. Certainly glass and porcelain are very much allied; on the one hand you make opaque glasses, and on the other transparent porcelain; there is no longer any line of demarcation. Of what service would this imitation be? Does not the quality and the merit of the glass consist in its transparency? Coffee in a glass cup and wine in a porcelain vase would be out of place. All these changes of ideas, by which it is thought to introduce novelty, produce only disorder. It is not the right way—it is nonsense, as the English term it. Our manufacturers should be on their guard. The Exhibition of London has shown us by comparison how much England has advanced in the manufacture of glass. In the courts at the South Kensington Museum, you see brought together the most mavellous specimens of glass which, manufactured at Tyre, Sidon, Byzantium, Bagdad, and at Cairo, Venice, and Rhodes, show to all

how art is allied to industry. The English artizan of the City did not miss the opportunity of taking a lesson from them.

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Pottery of an artistic character in France, as in England, has shown a considerable development, which only dates within the last few years. Since porcelain has replaced earthenware in everyday life, pottery has been hardly thought of, but artists and amateurs, wearied of the want of freedom and breadth of the painting on porcelain, have again given an honourable place to those Persian, Italian, and French potteries of the middle ages, which command such fabulous prices at sales. That Henri Deux ware, so beautifully inlaid—those potteries of Bernard Palissy—those Persian majolicas, with metallic lustres, manufactured in Europe by the Arabs of Majorca, and of which Maestro Giorgio found out the secret—even the enamel sculptures of Lucca Della Robbia, are at the present moment the object of the researches of "céramistes." Some more or less able, but not having industrial art as their object, have got into a difficulty and remain there. Some, on the other hand, if they are able to reconcile our wants of luxury with the real laws of decorative art, have an unlimited field before them, and will be able to realise all those marvels of fairy tales in which are to be seen palaces of rubies, emeralds, and sapphires, built, as it were, by enchantment.

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The Exhibition of Industrial Art has revealed to us the causes which point to the inferiority of France. The evil is in the confusion of systems and methods which has reached its climax, but with the evil it is necessary now to indicate the remedy. This remedy will be found in the direction which it will be possible to give to the Industrial Schools of Art. Before, then, that young heads are perverted by the sight of objects which surround us, place them in the midst of that which is pure and real, and develop from nature their precocious love of the beautiful, they will then proceed in the right direction, knowing where they will be instructed; then the young artists in leavingthe schools, will not consider it necessary to try historical subjects, and a grand style to reach a high state of perfection; they will learn that with talent and taste it is possible, without pretending to too much, to arrive at fortune and reputation. Forced to restrain their too ambitious flight, they will devote to industry their talents and their knowledge. We appeal to the great masters of the art not to disdain industry, but to give it their support; not, as it were, to imagine that nothing is pure in art, but upon the condition of being materially useless, and that from the moment when they put their foot to the ground, their art, by that very fact, is looked upon with contempt.

We will remind them that Raphael drew arabesques on the walls of palaces, designs and tapestry work for vestments and hangings—that Titian, Tintoretto, Paul Veronese, and many others used to do the same, and knew that in giving a truly artistic character to divers industries, they augmented the influence, the riches, and the glories of their beloved country. It was in their studios that they taught and made choice of artists destined according to their particular inclinations—one for the manufacture of mosaics, and another for the celebrated glass ware, for the potteries of Murano, of Gubbio, of D'Urbino, the cloths that the merchants of the Rialto sold to the princes of the earth, the arms and the jewellery of Ponte Vecchio, and of Palazzo Reale. Having a love for art they did not allow themselves to have imposed on them, by illiterate dealers, forms and colours which our industrial artists accept and execute without blushing, because their position is not such as to enable them to guide rather than follow the taste of the age. We have in France vitality and strength which cannot fail us.

That period of the middle ages, which the intelligent commerce of the Italian Republics made to shine with such brilliancy, and when art was both elevated and healthy, because its promoters never forgot to take the useful as the starting point, should serve as an example. Let us apply ourselves to the work with courage, and by our legitimate anxiety at the sight of the progress of English industrial art may French Industrial Art be regenerated.

ELECTRIC FERTILISER.—Under this title the Abbé Moigno, in "*Les Mondes*," describes a process, by M. Bazin, for converting the nitrogen of the atmosphere into nitrate of ammonia, and using it for fertilising the soil. Water, in a state of extremely minute division, is caused to pass into a reservoir; a blowing machine forces into this artificial fog, as it may be called, a large quantity of air, which thus becomes saturated with moisture; sparks from an electro-magnetic machine are continually passed through this mixture of oxygen, hydrogen, and nitrogen, which cause the formation of nitric acid and ammonia and nitrate of ammonia. The water which is not decomposed dissolves the salt, and the reservoir in a short time contains a solution of nitrate of ammonia, of sufficient strength to be employed in the fertilisation of the soil. M. Bazin states that a litre of water thus treated will give one gramme of nitrate of ammonia. The chief expense is the fuel consumed in driving the magneto-electric machine, and the operation resolves itself into a transformation of coal into nitrate of ammonia. M. Bazin then proposes to use a machine, which he terms an "electric fertiliser," which is in the shape of a plough, the share of which, in the form of a knife, cuts the soil to the depth of about fifteen centimetres. The two poles of a small electro-magnetic machine, giving off a number of long sparks, are placed in communication with the soil. The apparatus is carried complete on a carriage, and is sufficiently light to be drawn by one horse. To it is affixed a cask for watering, with a cock for letting off the liquid placed close to the ploughshare, filled with the solution of nitrate of ammonia produced as above, or with any other liquid manure suitable for the soil or the crop intended to be grown. The description of this machine and its action is by no means clear, but such is all the information that is at present given. How far the production of the nitrate of ammonia by this process, and its use by means of the above machine is economical, M. Bazin does not give any data for calculating.

BOOTS AND SHOES BY MACHINERY.—A manufactory in which boots and shoes are made upon an extensive scale, by machinery, has been recently established in New York, and is thus described by the *Scientific American*:—"Three large apartments are occupied by the operatives, mechanism and goods. The skins for the uppers are first spread out, examined, and selected, according to the purpose for which they are required. Different cutters then cut out the respective parts, according to the size and form required, and these are all arranged and classified. After this these separate parts are given out in lots to be sewed by machines, and those uppers which are intended for boots are crimped, and the whole made ready for receiving the soles. The more heavy operations of punching, sewing, pegging the soles, and finishing the articles are next executed. The sole leather, in hides, is first steeped in a tank to soften it; then it is thoroughly dripped, and afterwards cut by a machine into measured lengths of a certain breadth, according to the size of the sole wanted. After having become sufficiently dry, these cut strips of leather are run between rollers, and also submitted to severe pressure under plates in a press, so as to effect as complete a compression of the fibres as is attained according to the old mode by beating with a hammer upon a lapstone. From these compressed strips, soles of the different sizes are punched out at a single blow by a machine, the cutter of which is of the size and form required, and it turns round so as to cut a right and left sole alternately. Heel-pieces are also cut out by hollow punches at a single blow. The edges of the soles and heels are next smoothed

and polished in a small rotating machine; and another machine then makes the channels in the soles for the rows of stitching. After this the under soles and uppers are fitted upon lasts and made ready for sewing. The operation is executed by Mackay's peculiar machine adapted for this specific purpose. The waxed thread is wound upon a vertical spool, and is conducted through a guide situated upon the top of an elbow secured on a swivel joint capable of turning under the needle, and conducting the thread into the crease round the sole. The needle operates vertically above the sole, and the waxed thread is led into the interior of the boot or shoe by the guide, the needle descending through the sole, drawing through the thread and forming the stitches, which are pressed down close into the crease by a tracer-foot, upon which great pressure is exerted. In this manner the soles and uppers are united firmly and neatly together in a few seconds, without employing a welt. Hand-sewing cannot be compared with such machine work for accuracy and rapidity. Another machine is employed for putting on double soles with copper pegs. A thin strip of copper is fed in at one side and the holes are punched in the sole, the pegs cut and put into the holes, and then driven down by one continuous operation, with a speed corresponding to that of sewing the soles. The crossing of the half sole at the instep is pegged, and also fastened with a screw at each side by hand; the heels are also pegged down. The edges of the heels are neatly trimmed by a small rotating machine, and the soles are also rubbed down by a machine; so that nearly all the operations connected with the manufacture of boots and shoes in this establishment are performed by machines designed especially for the purpose. The legs of the boots are stretched and the wrinkles removed by new boot-trees secured to benches, and are expanded in an instant from the interior by pressing on a treadle with the foot. These boot-trees are altogether superior to the clumsy old wedge kind. The materials used in the manufacture of these articles appear to be of a superior quality, the machine not being adapted for operating on inferior patch leather. Another novel feature connected with these machines is that they are driven by one of Roper's hot-air engines; it has been running for several months, requiring but little attention, and consuming a very small quantity of fuel. The accurate operations of these machines, and the rapidity of their action, place them in a highly advantageous position for manufacturing boots and shoes. One hundred men will turn out with these machines as much work as four hundred men without them. About 500 pairs can be turned out daily in this establishment. Perhaps no labour connected with boot making is so severe as that bestowed upon burnishing the heel with a warm iron. This work is still executed by hand, but a machine is now being set up to accomplish this finishing operation, and it will soon be at work."

COTTON IN CYPRUS.—It is stated that the experiment made of the cultivation of cotton in this island has succeeded beyond all expectation, and the price of raw cotton has increased tenfold. What was worth only from eight to ten piastres now sells for seventy piastres. The crop of last year, which promised well, was totally destroyed by locusts, and it became necessary to sow the ground anew; but precautions are to be taken to prevent a repetition of the disaster. The Ottoman Government, with a view to encourage the cultivation of cotton in Cyprus, is selling land at the rate of from 20f. to 50f. the measure of two-and-a-half acres, giving at the same time great facility for the payment, exemption from taxes for many years, and liberty to import spinning machines free of duty.

CHEAP LANTERN POLARISCOPE.—Mr. Samuel Highley has recently introduced a polariscope that can be used in conjunction with the magic-lantern, without the instrument being sent to an optician "to be fitted" with such an adjunct, and at a moderate cost. The *Electrician* gives the following description of the instrument:—"The various parts are mounted on what the inventor calls 'a gout-board support;' the upright is fitted with an adjustable panel that carries a bundle of glass plates on one side and the stage and power on the other; this allows of the entire arrangement being accurately 'centred' with any lantern with which it may be employed; when adjusted, the panel is clamped by means of a milled-head screw. The 'bundle' consists of such a number of thin glass plates as will give a bright reflected beam of polarised light, and is attached to the panel at the proper angle for producing such a beam. The spring stage for carrying selenite designs, unannealed glasses, pressure and heating clamps, and the larger objects, is formed within a large tube attached to the front side of the panel; and to the front of this is screwed a spring jacket, within which slides the power and stage for the smaller crystals employed. To the front part of the base-board an adjustable rod is fixed that carries the analyser, which consists of a large prism, made expressly for the purpose of giving a large and pure field of colour, the absolute field attainable being of course dependent on the intensity of the source of light employed, as oil, oxy-calcium, oxy-hydrogen, or the electric. Provision is made for rotating both the smaller and larger objects, when necessary for the demonstration of certain phenomena. When selenite designs are shown on the screen, the crystal power is replaced with another of suitable construction. To use this polariscope, the nozzle is placed at right angles to the screen, and the base-board is then clamped to the table. The front lenses of the magic-lantern are removed, the condensers only being employed, and the source of light moved till a beam of parallel rays is produced; the lantern nozzle is then pointed at the bundle till the rays are incident at the polarising angle for glass, the proper direction being indicated for the uninitiated by a white line marked on the framework, the right adjustment of parts being further indicated by the appearance of an even disc of light upon the screen. A design is then inserted in the large stage, its lines of construction focussed, the analysing prism inserted in its jacket, and the coloured effect produced and varied, either by the rotation of the prism or the rotation of the design or crystal. By removing the panel from the support, and placing it before a window, with nozzle pointing upwards, and adding a suitable power, it may be then used as a table polariscope, or the light of a reading lamp may be employed as the source of light."

MULHOUSE SCHOOL FOR TEACHING THE THEORY AND PRACTICE OF MECHANICAL WEAVING.—At Mulhouse a school of the above character has been established, under the patronage of the "*Société Industrielle*" of that place. The object of the school is to supply that which the professional teaching of the district does not include, namely, the affording to young persons opportunities of studying the general theory of weaving, and its various applications to all kinds of fabrics. The approach of a more lively struggle with foreign industries has caused a greater need for this institution. The students leaving this school with good certificates, and well educated in other respects, it is confidently expected will render good service to any establishment with which they may afterwards become connected. Its organisation on a good foundation is due to the liberality of the merchants and manufacturers of the Department, who have come forward with funds. It is established on the footing of a manufactory, and forms a complete establishment of itself, with steam power and machinery, with workshops for repairs, &c. It contains power-looms for weaving with from one to six shuttles, of both French and English construction, on the different systems of the most recent and most perfect kind; there are also hand-looms, Jacquards, a complete series of preparatory machines, such as machines for reeling, warping, &c., besides all kinds of machines and models for the purpose of initiating the student in theoretical knowledge, to be followed by practical demonstration. The course of study is separated into two divisions, the one for theory and the other for practice. The two,

however, go on together, that is to say, the student passes regularly in succession from theory to practice. The first division comprehends specially the studying and analysing the various structures of the different kinds of fabrics, particular attention being given to fabrics which are specially adapted to the wants of the district. This course finishes with the making of drawings of the machines in the school, the study of the best arrangements for producing new styles of fabrics, the making plans and calculation of the cost price of the material and the manufactured article, book-keeping, &c. The practical course consists of actual hand-work—the mounting, arranging, adjusting, repairing, and keeping the machines in good order; the putting into practice those things which the pupils have learnt in theory, going through all the preparatory operations, each pupil being assisted by a skilled foreman. Besides, every day, there is a special course of two hours for journeymen desiring to learn the art of weaving. Each pupil is attended to separately, and never is allowed to pass on to anything fresh until he has a perfect knowledge of the preceding subject. The cost of admission to the theoretical and practical courses is fixed at 600fr. (£24) a year for each pupil. A pupil may enter for one course only. The admission fee for the theoretical course only is fixed at 300fr. (£12) a year, and the fee to the practical course at the same amount. The school year consists of eleven months. The fee for the special course of two hours is 25fr. (£1) a month, and is paid in advance. Paper, and all necessary materials and specimens, must be provided at the cost of the pupils. The annual payments are made half on entering and the balance three months afterwards. These fees remain the property of the school, whether the pupil remains the whole time or not. Foreigners, as well as natives, are admitted to the school. As each course is personal, a pupil may be admitted at any period of the year. He must produce on entering certificates of good conduct and ability from other institutions he may have been at. A certificate of skill is given to the pupil on his leaving, only when he has deserved it by assiduous attention to his work and irreproachable conduct. At the conclusion of his studies the pupil is compelled to pass an examination, the result of which is sent by writing to the director. This examination consists in answering questions relating to the theory and practice of weaving, as well as the preparatory processes which the candidate has studied during his stay in the school. The pupil must besides show himself capable of explaining and analysing all the specimens of fabrics which may be placed before him in connection with each of his theoretical courses. He must also submit a general plan of the school, with its prime mover, and shafting and drawings of the different machines; complete plans of the various methods of weaving; his note book of his courses of instruction and work, and the whole must be done with great care and neatness. The course commences and continues as follows: in the morning from eight o'clock to twelve, in the afternoon from two o'clock till six, with the exception of Saturdays, when the school closes at four o'clock. Pupils who do not arrive at the school within half an hour of the times fixed will not be admitted. For pupil workers the school is open at seven o'clock in the afternoon. The school is closed on Sundays, and on days of legal holiday. Everything tending to disturb the course of work, whether noise, singing, or talking, is prohibited, as well as smoking in the lecture-rooms, work-rooms; or the introduction of eatables or wine. No pupil can introduce persons to see the workshops without the permission of the director. No one is permitted to meddle with a loom except in the presence of the foreman, who must always be present, and must see when the work is over that everything is put into its place. This rule must be strictly adhered to, in order to prevent accidents to the machines, &c. On days for practical working all the pupils are obliged to be in the weaving workshops, and must do their utmost to produce good work, and make as little waste as possible. The steam-engine, the heating, and the oiling the machines, &c., is placed in charge of the pupils in turn, according to a fixed *rota*. They must take special care to prevent accidents, and, on the least derangement of the machines, must immediately report the same to the foreman. The holidays are fixed by the managing committee. Monthly reports of the conduct and work of each pupil are sent to the parent, in order that he may know what progress is made. The pupils must conform in every respect to the rules; every infraction of the rules, if repeated, every want of respect towards the director or foreman, frequent late attendances at work or absences without good reason, and any other grave fault, even out of school, are reported to the Managing Committee, who have power to expel any pupil so neglecting his duties. The manufacturers and merchants who want information on any special kind of work, or on the arrangement of any kind of work, have the privilege of applying, verbally or in writing, to the director for information; and the information given, accompanied, if required, with demonstrations at the school itself, are charged for according to the time taken up in the matter, or the difficulty of executing the fabrics, in respect of which explanation is required. An annual subscription, the conditions of which are supplied by the director, may be made in lieu of payment for such advice. In order to assist inventors in trying improvements, the school affords its co-operation to those interested, and receives machines and inventions, and will submit them to the *employés* in the shops. The school will undertake, if asked, to make known to the inventors the observations which such an examination has elicited.

NEW KIND OF SKATE.—Mr. H. Cholmondeley Pennell has forwarded to the Society's House a specimen of a skate, invented by him, with two blades, his principal object being to facilitate the acquirement of skating by young people and persons with weak ankles. In describing his invention, he says:—"The ordinary single-ironed skate imposes upon beginners very great, and, to ladies and persons of delicate frame, almost insuperable difficulties in the way of its use; difficulties which are, it would appear, by no means unavoidable, but to be attributed to the want of application of the ordinary principles of mechanics. Thus, in the common skate, the sole of the foot is raised unnecessarily high above the ice —about $1\frac{1}{2}$ inch—the edge of the iron on which the body has ultimately to be balanced is extremely narrow, whilst the portion of it actually touching the ice at any one time is little more than half-an-inch; in the new skate, however, the sole is only raised from one-half to three-quarter of an inch, and the portion resting is $1\frac{1}{2}$ inch. It may also be added that the old skate weighs more than half as much again as the new one—the weights being 14 and 9 oz. respectively—and that there is a considerable difference in the manufacturing cost in favour of the new skate, which is besides much more durable and far prettier on the foot. Another portion of the invention consists of a heel-peg, which is capable of application to ordinary skates. This has a point projecting below the iron, and capable of being raised and lowered at will, by means of a screw. Its object is to check or stop the skate the moment the body of the skater is thrown backwards in the act of falling; the peg is then driven more or less forcibly into the ice, and effectually prevents the skate slipping from underneath, and the consequent fall. Whilst the body is in the ordinary skating position, this peg can be arranged so as never, or hardly ever, to touch the ice; and when the skater is no longer in need of precautions, it can be readily screwed up away from the ice altogether." In conclusion, the inventor states that his main object in bringing forward this invention is to increase as much as possible the out-door amusements in which ladies can take part, which, in view of the present highly artificial constitution of society, is a point well worthy of consideration.

Commerce.

Trade Marks.—The Duke of Newcastle has forwarded to each of the governors of the British Colonies, to be laid before the Colonial Legislatures for action thereon, a memorial, addressed to him by about thirty of the principal manufacturers of goods, wares, and merchandise, using trade marks to distinguish and identify the articles manufactured by them. They complain that, in the course of their various dealings with many of the colonies, they are far less protected against the trade frauds and constant imitations and forgeries of their trade marks than in the United Kingdom itself, or in those foreign countries with which we have commercial treaties. The piracies complained of and the frauds alluded to are matters of daily occurrence, and carried on with the utmost openness and practically with perfect impunity, and they therefore ask that the law of the various colonies of the empire may be assimilated to the improved law of the mother country.

Foreign Competition.—The Paris correspondent of the *Times* writes :—French trade is indeed far from being ruined by French competition. Manufacturers admit this, and the protectionists, who predicted ruin and desolation, are almost dumb. I have just heard of an American company in want of rails instructing its agents to give a large order to the manufacturer who should supply the best article at the lowest price. The agents tried some houses in England, and then in France, and finally gave the order to a long-established and well-known firm in the department of the Moselle, where they found what they wanted, at least as good, and certainly cheaper than in England. The head of the establishment is M. Wendel, one of the richest ironmasters, and until now one of the most ardent and, I dare say, sincere protectionists in France. He has beaten the English manufacturers in open competition.

Trade in France.—It appears from the official returns published of the imports and exports for the first 11 months of the year 1863 that trade in France improved during that period. The imports amount to 2,179,527,159f., showing an increase of 155,313,933f. over the corresponding period of the year 1862. The exports amount to 2,384,875,256f., being an increase of 371,083,360f. over the year 1862. If to these figures be added the value of the precious metals imported and exported, which are given separately in the official returns, but which are bought like any other merchandise, the imports will amount to 2,666,000,000f. for 1863, and to 2,498,000,000f. for 1862, and the exports to 2,939,000,000f. in 1863, and to 2,407,000,000f. in 1862. The Customs duties produced 159,000,000f. during the first 11 months of the year 1863, and only 138,000,000f. during the corresponding period of the year 1862. It was the sugar imported which produced this increase in the Customs receipts. The foreign and colonial sugar imported into France in the year 1861 produced each, in round numbers, 24,000,000f., and in 1863 each 43,000,000f. There is likewise an increase in the duty paid on fermented liquors imported. It amounted in 1863 to 186,000,000f., and in 1862 to 178,000,000f. Tobacco produced 205,000,000f. in 1863, and 200,000,000f. in 1862. The duty on salt has not recovered since it was reduced, and there is a loss on gunpowder. The stock of merchandise in the bonded stores on the 1st of December, 1863, was inferior to that of the corresponding period of the two previous years. The quantity expressed in metrical quintals was 2,455,000 in December, 1863, 3,019,000 in 1862, and 3,173,000 in 1861. It is particularly in the Havre and Marseilles stores that the merchandise has diminished. There were more French ships employed in the importation of merchandise in the year 1863 than in former years, and still more in the export trade. There were likewise more ships employed in the import trade, but fewer in the export of merchandise. The tonnage inwards amounted to 4,193,550 tons, and outwards to only 2,940,592 tons. This is explained by the fact of the imports consisting of the raw material employed in the manufactories, and of coal, which weigh heavier than the manufactured goods exported.

Colonies.

Sugar Cultivation in Queensland.—The most extensive sugar plantation in this colony is on the estate of the Honourable Louis Hope, at Cleveland, and occupies one of the most pleasant situations in Moreton Bay. It consists of an elevated tract of land; the soil is, for the most part, of a friable loam, reddish brown on the surface, and deep red below; it is almost entirely free from stone, which is found only in the form of irregular pebbles of nearly the same colour as the soil, and apparently of ferruginous texture. Amongst Captain Hope's earliest experiments in cultivation was the planting of a small nursery of sugar cane, which, by successive propagations, and the introduction of fresh cuttings from other sources, he continued to enlarge for two or three years. Great difficulty was experienced for some time in getting a sufficient supply of canes to engage in the cultivation of sugar on a large scale, but it has at last been surmounted. At present there is an area of about twenty acres cropped with canes; about thirty acres more have been cleared, and it is expected that by this time next year the plantation will extend to between 60 and 70 acres. The ground has been prepared by ploughing and cross-ploughing; it is found advantageous to return the plough along the furrow so as to throw up the soil in ridges, with trenches for the storm water to run off clear of the roots of the canes. Holes are then hoed in the ground about a foot deep for the reception of the cuttings, which are about nine inches long, and contain from two to four "eyes," one of which appears on every joint of the cane. In ten days or a fortnight the sprouts show up, and as the young plants grow, the holes are gradually filled up with earth. The period required for the cane to arrive at maturity is uncertain, and depends materially upon the time of planting. Captain Hope has planted canes every month in the year, and his experience will no doubt shortly show which proves the most advantageous. When ripe the canes take no hurt by remaining in the ground, and they are only cut as required for the mill, it being desirable they should be ground as fresh as possible. The purple cane is the more hardy, but the yellow cane yields the best sugar. The canes must be cut as close to the ground as possible, in order to secure the greatest quantity of sugar, the richest juice being in the lowest joints. From experiments made by Captain Hope, the test of the saccharometer gives the juice richer qualities than are found in the average West Indian canes. Twenty-four canes yielded seven gallons of juice, from which was produced a splendid sample of sugar that was exhibited in Brisbane some time ago. The quantity of sugar made for exportation is but small. A mill for the manufacture of sugar is in course of erection; the plant, steam-engine, &c., are daily expected from England. The capacity of the machinery is estimated as equal to the requirements of a plantation of a thousand acres, being capable of crushing six tons of cane, the produce of three acres of ground, in 24 hours. The buildings at present on the estate consist of a kiln for burning lime to clarify the sugar, workmen's huts, overseers and storekeepers' houses, stores, &c. The Honourable Mr. Bigge is about to commence sugar growing; he is now clearing fourteen acres of the red soil, which will be planted with canes in a few months.

Queensland Botanical Gardens.—Repeated and successful experiments have been made here in growing the sugar-cane, the coffee plant, tea plant, tobacco, ginger, *Chinchona calisaya* (quinine-yielding plant of South America), cotton, the Paraguay tea tree, spices of all descriptions, and many other useful plants. The results show that the cultivation of the sugar-cane is likely to

prove very profitable. The experiment with the coffee plant has also been successful—the plant is at present in full bearing, and the berry is fine and full-flavoured; it is expected to yield from seven to nine pounds, whilst in Ceylon two pounds and a half from one plant is reckoned a fair average yield. A small plantation has been laid out, which gives every promise of success, so that it is plainly demonstrated that coffee can be profitably grown in Queensland. There are two plantations of *Thea Bohea*, consisting of several hundred plants, which are thriving well. The *Chinchona calisaya* was introduced in the early part of last year, and from the fact that it is being rapidly introduced into the tropical colonies its growth was looked forward to with much interest, and the plant takes kindly to the soil, and is in a flourishing state. The tobacco plant is also a success.

SLUGS IN AUSTRALIA.—A northern stockholder states that millions of slugs have been seen moving south-west in a body, and stripping the country as they go. They had cleared about one and a half mile long and from a half to three-quarters wide. The grasshopper birds have also returned, who, in the absence of grasshoppers, of which none have been noticed, may possibly take to the slugs and destroy them.

Obituary.

DR. JOSEPH BATEMAN, barrister-at-law, who died on the 10th November, was born on the 4th March, 1797, at Selby, in Yorkshire, where also he was educated, and in 1811 was articled to Mr. Edward Parker, solicitor, of that place. He remained with that gentleman until 1821, when he came to London to fill a situation in the office of Messrs. Carr, Solicitors to the Board of Excise, having previously entered himself at Lincoln's-inn on the 23rd April, 1819. In the year 1829 the relationship of Messrs. Carr to the Board of Excise ceased, a solicitor's department being established, on which occasion many of Messrs. Carr's clerks were incorporated with the revenue service, and from that date Dr. Bateman became a Government officer, eventually rising to the head clerkship, though by the ordinary rule of the service he was not eligible for further promotion. His character and talents, however, stood so high in the estimation of the Government, that when the office of Assistant-Solicitor to the Excise became vacant in 1846, the late Sir Robert Peel selected the deceased for the position, conveying the announcement of his appointment in the following very gratifying terms:—

Whitehall, July 4, 1846.

Sir Robert Peel presents his compliments to Mr. Bateman. He is very glad to have the opportunity of rewarding the long and faithful services of Mr. Bateman by a promotion, not in the ordinary course, but well deserved by him.

He was called to the bar on the 27th January, 1847. On the amalgamation of the Stamps and Taxes with the Excise, and their junction at Somerset-house, he retired from office, and found congenial occupation in his retirement in the exercise of his functions as a magistrate of the county of Middlesex. From his earliest years Dr. Bateman had employed his leisure in the pursuit of literature. One of his earliest publications was "The Highway Acts," which has gone through several editions. The standard work, "The Law of Auctions," was his next book. He also published "The General Laws of Excise," "The Excise Officer's Manual," and the large and important volume, "Bateman's Excise Laws," quoted as the authority in the courts of law. He early associated himself with Dr. Birkbeck and others, in the establishment of literary and scientific institutions, and by his own lectures and personal and pecuniary assistance, greatly aided in securing the prosperity of more than one of such associations. He became a member of the Society of Arts in 1840, and for several years took an active part in its proceedings, and assisted on one of the committees of the Exhibition of 1851. The deceased was much interested in the British Association for the Advancement of Science, and contributed several papers to its transactions. As a tribute to his scientific and literary acquirements and works, the University of Giessen conferred upon him the distinction of Doctor of Laws.

Publications Issued.

THE BROWN BOOK. (*Saunders, Otley, and Co.*) This is intended as a book of ready reference to the hotels, lodging and boarding-houses; breakfast and dining-rooms; libraries, public and circulating; amusements; hospitals, schools, and charitable institutions of London; with full information as to situation, specialty, &c. It contains a "handy list," showing the nearest post-office, money-order office, cab-stand, police-station, fire-engine, fire-escape, hospital, &c., to one thousand of the principal streets of the Metropolis. It also includes a notice of the literary and scientific societies, with lists of their meetings for the present session; particulars and (in some instances) plans of the theatres and other places of amusement, and an account of the various sights of the Metropolis. It is intended to publish an edition half-yearly.

Notes.

MEDICATED WINES AND THE EXCISE.—From a correspondence which has lately taken place between the Inland Revenue Board and the President of the Pharmaceutical Society, with reference to the necessity of a "wine license" for the sale of "medicated wines," such as "orange quinine wine," "aloes wine," "colchicum wine," &c., it appears that whenever articles are held out by label or advertisement as beneficial to persons suffering from any ailment affecting the human body, they can only be sold under a patent medicine license, and with a stamped label on each packet, and also in strictness under an Excise wine license (Foreign or British), according to the character of the wine. The Board, however, state that, except in cases where there may be reason to believe that a beverage is being sold under colour of a medicine, they will not interfere with the sale, without any Excise license, of medicated wines of the character indicated, provided such medicines do not fall under the category of patent medicines.

NEW MOTIVE POWER.—A machine has been exhibited at the Crystal Palace, by which it is hoped to introduce a new principle into locomotion. The invention is due to M. Casimir Noel, of Meaux, in France. This gentleman came to the conclusion that weight might be converted into motive power in the propelling of vehicles. The principle is not new, being already to some extent developed in the velocipede, and in the well-known action of the lathe in machinery. A car has been constructed which will move either with or without rails to go upon, and in which the weight of the bodies placed on it is so adjusted that with a very slight initiating power—whether human muscles, or horses, or steam—locomotion is stated to be effected with a great saving of force. The axles of the car are made with cranks, moved by elongated spiral springs; and the whole, with several persons on it, may be set going by one man, working his feet on a moveable part of the machine. The axles, instead of being connected with the naves of the wheels, bear on the main spokes of each wheel, and the weight falling on the spoke continues the motion which the operator has commenced. It is said that one man can wheel four hundred weight of stone on a barrow constructed on this principle, though the same weight on a common barrow is far beyond any ordinary man's strength. It is stated that M. de Lesseps has already ordered some of these barrows for the Suez Canal, but further information is necessary before any

definite conclusion can be arrived at as to the value of the invention.

The Charing-cross Railway.—This line was opened on Monday, the 11th inst., not being, however, yet completed to Cannon-street. The line, though scarcely two miles long from end to end, has been nearly four years in construction. It runs entirely on bridges or arches, there being no less than 17 bridges and 190 arches, of which latter 18 are taken over streets and three over courts. Of the 17 bridges one crosses the Thames, the others cross great main thoroughfares. Those over the streets are among the longest single street spans ever built. The quantity of wrought-iron in the Charing-cross-bridge is 5,000 tons, and of cast-iron 2,000 tons. The bridges over the streets contain 3,250 tons of wrought-iron and 250 tons of cast-iron; 151,000 yards of brickwork with 41,000 yards of concrete were required to complete the arches, and 90,000 cubic yards of earthwork have been made.

Petroleum in Russia.—It is stated that a district has been discovered in Russia of similar formation to that of the oil-producing regions of Pennsylvania and other parts of America, and that an American has obtained a concession from the Russian government of a tract of 50,000 acres.

South Kensington Museum.—The following advertisement appeared in the *Times* of the 5th instant:—"To Architects:—The Commissioners of her Majesty's Works and Public Buildings give notice that they are prepared to receive designs from architects for two new museums, to be erected on part of the land, at South Kensington, recently purchased by the government, and used in 1862 for the International Exhibition. Plans of the grounds, together with a statement of the premiums and other particulars will be forwarded to architects on application, by letter, addressed to the Secretary of her Majesty's office of Works, 12, Whitehall-place, London.—January, 1864."

British Museum.—The time-honoured custom of maintaining a military guard at the British Museum was discontinued at the close of last year, when the sentinels on duty at the principal entrance were permanently displaced, and the sentry boxes removed. The charge of the national collections has devolved upon the Metropolitan Police, some of whom are constantly stationed within the building. This arrangement extends to the National Gallery and other public institutions.

Correspondence.

THE ALLEGED EARLY PHOTOGRAPHS.

Sir,—For some months past the world of Photographers in London has been in a high state of excitement owing to the discovery, among the papers of the late Matthew Boulton, of a series of coloured prints which are supposed to have been produced by some process now unknown, and at the same time two early specimens of pictures on silvered plates were produced from a drawer at the Soho works. Mr. Smith, of the Museum of Patents, who met with these specimens, in relating the history of the pictures which he supposed to be photographs, stated to the members of the London Photographic Society, at its meeting in November last, that

"Although a long time had elapsed since the matter had come into his hands, and he had expended much time on the subject, he was still far from having secured as full and satisfactory details as he could have desired. About twelve months ago he visited the Soho Works at Birmingham, on business connected with obtaining Watt's first engine for exhibition at the Museum of Patents, when, by the kindness of Mr. Price, a gentleman who was agent for the Boulton family (an office which he and his family had held for two or three generations), he saw various matters connected with their inventions. Mr. Price showed him two of the pictures now on the table. Seeing him interested in the matter, Mr. Price then brought out of a drawer the two pictures on silvered plates (he would not call them daguerreotypes). He thought the matter over, and it struck him, from what he had seen and heard, that they must be something important. He wrote to Mr. Price about them, who told him all he knew of their history. He then asked him for them, that they might be preserved in the Patent Museum. Mr. Price sent them up, and he commenced his further investigation. His own opinion was, that the paper pictures were the production of the camera-obscura, that the image was thrown on to paper prepared with some chemical substance, which retained the image, and that it could then be transferred, as some of the documents he had obtained stated, to other surfaces, such as copper, iron, &c. The pictures were produced on paper such as was not made now, but had been made about 100 years ago. It had no date, but bore the name of Whatman. The present owners of the mills where it was made, Hollingsworth and Co., had since then added a date to the paper; but they informed him that the name only used to be employed, and that the paper was probably 100 years old. It was the strong, coarse, wire-marked paper. One of the first points which struck him was, the figures in one of the pictures ("Venus and the Graces," by Angelica Kauffman) seemed left-handed; and shortly afterwards he was able to procure an engraving of the same subject by Bartolozzi, which was drawn just the reverse. He then found that the figures in all the paper pictures seemed to be left-handed. In the large picture by West, for instance, they would perceive that the physician was using his left hand to feel the pulse. These paper pictures, he found, were produced by a method invented by Mr. Francis Eginton, about the year 1773. He was taken by the hand by Mr. Boulton, who appeared to have undertaken the production of the pictures from any painting, and securing copies on paper, copper, canvas, &c. This transfer appeared to have been on what was termed, in the documents he had found, "dead colour." When thus produced, they were frequently finished as oil-paintings, water-colour drawings, &c., and passed into the hands of Mr. Barney to colour. A large number of them appeared to have been done, the subjects including the choice works of the best artists of the day. The paper pictures appeared to be an invention distinct from the pictures on the silver plate. Eginton's process appeared to flourish in 1780; but nothing more was heard of the matter after. The silver-plate pictures appeared to have been produced about the year 1791. Then there were, next, two pictures by Thomas Wedgwood, which, by the kindness of Miss Meteyard, he was able to show them; they appeared to have been taken about the year 1791. Josiah Wedgwood was a member of the Lunar Society, with whom it was probable the invention originated; and it was very probable that he would tell his son Thomas what had been done; so that he might have derived his ideas on the subject from this source. He would, however, without further remark or hypothesis, read the various documents from which the history had to be deduced. They were sorted from a mass of papers taken out of Mr. Boulton's private library seventeen or twenty years ago, and at that time the library had not been opened for about fifty years."

Mr. Smith, having so stated his case, proceeded to read extracts from a number of letters and other documents which had been selected from a mass of correspondence found at the Soho Works, and which he considered tended to prove the hypothesis that the pictures in his possession were produced by chemical or photographic agency at a date prior to 1791.

With reference to the silver pictures, I would merely state that the evidence produced in support of the date of their supposed production does not in any way justify the assumption that the daguerreotype art was either known or practiced at Soho in 1791. At the same time it is generally admitted that the plates in the possession of Mr. Smith are early specimens of the daguerreotype art. My present object is rather to endeavour to point out what I believe to be a fallacy in attributing the production of the paper prints to photographic agencies.

It will be seen from Mr. Smith's statement that the prints were produced by a method invented by "Mr. Francis Eginton about the year 1790, that he was taken by the hand by Mr. Boulton, who appeared to have undertaken the production of copies from any painting, and securing copies on paper, copper, canvas, &c." The copies were made in what had been called "dead colours," and in some cases two or more colours were employed. When thus produced "they were frequently finished as oil paintings, water-colour drawings, and passed into the hands of Mr. Barney to colour."

The sepia tone of some of the prints corresponds with the tint of a large number of the photographs now produced, while the extreme delicacy of the surface from which the impression was taken has led to a belief that they could only be the result of chemical agents acted upon by light. This opinion is also based upon the fact that the impressions were taken on paper, the surface of which had been specially prepared, and after the lapse of nearly a century the prepared surface can be removed by friction, and the entire impression obliterated, the image not having been absorbed into the body of the paper, the paper itself being a hard and not a soft printing paper. Mr. Eginton secured copies on paper, copper, canvas, &c., and they were frequently finished as oil paintings, water-colour drawings, &c. All this appears to me to be quite intelligible to the eye and mind of any practised engraver and printer; and the prints themselves seem to interpret the mode of their production. In the first place I would say that the paper on which the impression is taken bears unmistakable evidence of the use of a metal plate, a well-defined line having been impressed on the paper by the edges of the plate in its passage through the printing-press. This is quite consistent with the production of copies of pictures on copper, iron, &c. With reference to the next point, the method by which the minutely granulated surface was obtained, I believe that any skilful acquatint engraver could reproduce a similar surface at any moment, if it were desired, by simply laying the ground of his plate by means of a delicate solution of any of the gums or resins used by acquatint engravers, the gradations from light to shadow in the pictures being dependent upon the action of acid in biting in upon the surface of the plate so prepared. That the effect obtained was due to an acid action is to me evident from the flatness of the parts of the picture which have been stopped out. This is especially apparent in the foliage in some of the impressions. Next as to the materials upon which the print was produced, paper, canvas, &c., the copies being frequently finished as oil paintings or water-colour drawings. The prints in the possession of Mr. Smith are upon a hard paper, the surface of which has been prepared, some of the impressions being in two or more colours. It was a common practice during the latter part of the last century to print from mezzotinto, acquatint, and chalk-engraved plates in several colours, and I think that anyone who will carefully examine the Soho impressions, will detect ample evidence of a compound process of printing with coloured inks. These inks were applied to the plate according to a process given by Mr. Robert Laurie in 1776, and published in the second volume of the Society of Arts' Transactions, where he says:—

"As the ingenious and laborious works of many eminent men have been ushered into the world with inelegant and inexpressive cuts, principally owing to the great expense attending the execution of good engravings, I have been induced to attempt a method of engraving and printing in colours, which has answered my most sanguine expectations, both with respect to the ease and expedition with which they are executed, and consequently the little expense at which they may be afforded. In this manner, animals, plants, &c., for illustrating natural history, may be finished in their proper colours, very much like drawings, and greatly resembling nature. The plates will also admit of being repaired, so as to furnish a large impression. If this, my first attempt, should meet your approbation, it will encourage me, under your inspection, to proceed on a more extensive plan. The bird represented by the prints now laid before you, is taken from one which Captain Cook brought from between the tropics, caught in his last voyage round the world, and I beg leave to submit the plate, from which the impressions were taken, to the consideration of the Society. Mr. Laurie's explanation of the method of taking coloured prints from mezzotinto plates is as follows:—A copper plate with an etched or engraved outline, dotted next the lights, and filled in with mezzotinto ground, is printed in colours, after nature, or from a picture, by the following process. The plate being warmed in the usual manner, the colours are applied, by means of stump camel hair pencils, to the different parts, as the subject suggests; it is then wiped with a coarse gauze canvas, any other being improper; after this it is wiped clean with the hand as in common practice, and being again warmed, is passed through the press. The colours are mixed with burnt linseed oil, and those generally used by painters are proper.—ROBERT LAURIE, aged 20, Nov. 1776."

This process of compound printing is now continued in a modified form, small dabbers being used for the broader surfaces in place of the stump pencils.

If the impression was to be finished as a water-colour drawing, it would be necessary to use a hard paper or to prepare the surface by coating it with isinglass, gum, albumen, sugar, or any of the ordinary common and well-known mediums. If a water-colour was to be copied, albumen or gelatine would probably be the material with which it would be prepared, a water-colour being used in printing from the plate; the two would then combine, but the colour would not be absorbed into the paper; if the coating of gelatine was thick, it would in a century be likely to perish, and there would be no difficulty in rubbing off the impression from the paper. If an oil picture was to be imitated, gelatine would not be used, as the two would not combine. If canvas was used to print upon, no doubt oil colours would be employed. In the case of water-colours it was necessary to harden the surface of the paper, in order to prevent the colours applied by hand from running or spreading. I have thus endeavoured to show how paper, copper, and canvas, and their employment, are quite consistent, and how at the same time the surface of the metal plate could be obtained from which to print in either oil or water colours. In conclusion, I would venture to assert, that if it were desired on the ground of economy to reproduce any of the specimens exhibited by Mr. Smith, there would be no difficulty in finding the engraver and printer in the present day who would be ready to undertake the work.—H. G. H.

TRADE MARKS.—SIR,—As a leading article in to-day's *Telegraph* advocates the adoption of letters and numerals as trade marks, and as a letter from Mr. Chubb, suggesting the use of numerals as trade marks, appeared in a recent number of the *Standard*, perhaps you will kindly permit me to mention that a proposal, recommending the employment of combined letters and numerals for trade marks, emanated from me, in a letter entering fully into the subject, which appeared in your *Journal* as far back as March, 1862.*—I am, &c., M. HENRY.

Fleet-street, 7th Jan., 1864.

MEETINGS FOR THE ENSUING WEEK.

MON. ...British Architects, 7.
Medical, 8½. Mr. Spencer Watson, "On Inflammation of the Cornea, and the Influence of Morbid Secretions on the Mucous Surfaces of the Eye."
Asiatic, 3.

TUES. ...Civil Engineers, 8. Discussion on Mr. Heppel's paper, "On the Closing of Reclamation Banks." And, time permitting, Mr. J. B. Redman, "The East Coast between the Thames and the Wash Estuaries."
Statistical, 8. Professor Hind, "On the Commercial Progress and Resources of Central British North America."
Anthropological, 8.
Royal Inst., 3. Prof. Tyndall, "On Experimental Optics."

WED. ...Meteorological, 7.
Society of Arts, 8. Dr. A. Voelcker, "On the Injurious Effects of Smoke on Building Stones and on Vegetation."
Geological, 8.
London Inst. 7.
R. Society of Literature, 4½.

THUR. ...Royal, 8½.
Antiquaries, 8.
Chemical, 8. 1. Mr. W. M. Watts, "Absorption of Mixed Gases in Water." 2. Dr. Thudichum, "On Uro-chrome."
Linnæan, 8. 1. Dr. Baird, "On a new *Annelid* from the Island of Ascension." 2. Dr. E. P. Wright, "On a new species of *Xylotria*, inhabiting Fresh Water." 3. Mr. Holiday, "On *Dicellura*, a new genus of *Thysanura*."
Numismatic, 7.
R. Society Club, 6.
Royal Inst., 3. Prof. Tyndall, "On Experimental Optics."

FRI.......Royal Inst., 8. Mr. W. R. Grove, Q.C., "On Boiling Water."

SAT. ...R. Botanic, 3¾.
Royal Inst., 3. Mr. J. Lubbock, "On the Antiquity of Man."

* Vol. X., p. 255.

Patents.

From Commissioners of Patents Journal, January 8th.

GRANTS OF PROVISIONAL PROTECTION.

Æriform and other fluids, apparatus for regulating the passage of—3096—M. Henry.
Agricultural machinery—2948—J. Platt.
Apparatus for controlling the passage of fluids—3226—M. Henry.
Apparatus applicable to time, fare, distance, and other tables, almanacs, &c.—2882—T. C. Kimpton.
Blinds, Venetian, painting—3172—J. M. Bryden.
Boilers, feeding—3220—E. Wilson and G. Lindsley.
Boots and shoes—3150—C. Stewart.
Boots and shoes—3068—J. H. Simpson.
Bracelets of papier mache, &c.—3269—T. W. Davenport and S. Cole.
Brewing—3032—R. L. Clifton.
Bricks, &c., preparation of clay for the manufacture of—3145—J. Platt and W. Richardson.
Brooches, fastenings for—3106—T. Perks.
Cases for packing bottles—3184—G. H. Ellis.
Cash taking, apparatus for checking—3064—J. F. Hallet and T. L. White.
Casks, machinery for manufacturing—3166—J. Davidson.
Chromate of potash, &c., manufacture of—3160—W. Thornthwaite.
Cleaning roadways—3188—J. H. Johnson.
Coal, &c., machinery for cutting and boring—W. and S. Firth and J. Sturgeon.
Cottages or houses, portable—3196—R. Saunders.
Cotton, cleaning—3056—J. Conlong.
Cotton gins—3230—A. V. Newton.
Cotton gins—3283—T. Bourne.
Cotton, pressing into bales—3170—C. J. Robinson.
Crinolines—3070—R. A. Brooman.
Cutlery handles—3257—H. Barber.
Distillation of bituminous substances—3037—R. A. Brooman.
Driving bands and pulleys—3098—E. N. Gregory.
Engines for hauling agricultural implements—3126—T. Webb.
Fibres, softening and separating—3287—W. Whitaker and W. Tongue.
Fire-arms—3108—N. Kennedy, jun.
Fire-arms, breech-loading—3072—R. Richards and S. C. Willetts.
Fire arms, breech-loading—3275—E. Lindner.
Floor cloths—3210—F. Walton.
Fluids, drawing off and measuring—3263—H. P. Forrest.
Food for cattle—3174—J. Sellars.
Fusees, &c.—3080—G. C. Grimes.
Gas generators—3136—T. Clayton.
Gas, increasing the illuminating power of—3289—N. F. Taylor.
Gas stoves for heating, &c.—3042—D. Hulett.
Glass, manufacture of—3154—E. Rascol.
Grass cutting machines—3092—J. E. Boyd.
Guns, hydraulic presses, &c., strengthening—3164—L. Nobel.
Harrows, cultivators, &c.—3050—J. Green.
Hats and bonnets, ornamenting—2804—A. C. Durst-Wild.
Heating and ventilating horticultural buildings—3094—P. R. Wason.
Holder for cotton reels—3224—R. Mason and E. J. Green.
Horse, mechanical wooden—3163—V. Obert.
Hot-water and hot-air stove—3048—J. Corbett.
Houses, &c., of plastic materials—3228—M. Henry.
Hydraulic pressure gauges—3060—S. Smyth.
India rubber and gutta percha compounds—3116—G. T. Bousfield.
Iron or steel walls, shot proof—3202—R. Legg.
Kilns, malt and hop—3124—A. Epps.
Kilns for calcining ironstone—3273—J. Gjers.
Lamps for burning hydro-carbons—3130—J. Cliff.
Lamps, apparatus to be applied to—3146—W. T. W. Jones.
Letter boxes—3197—H. A. Bonneville.
Liquids, racking and decanting—3206—W. E. Gedge.
Locomotive engines and trains, &c.—3195—W. B. Adams.
Locomotives, reversing the motion of—3104—W. Macklin.
Looms—3058—G. Wilson.
Looms—3090—R. Harrowby, J. Foulds, and A. Harrowby.
Looms—3120—J. Bullough.
Looms—3291—D. Naylor.
Lubricating the cylinders of steam engines, apparatus for—3218—R. H. Taylor.
Machinery for grinding farm produce, &c.—3297—J. Patterson.
Mines, supplying air to lights in, &c.—3265—W. H. Bowditch.
Motive power, apparatus for obtaining—3277—E. Bramall.
Nails and rivets, machinery for making—3118—E. Darwen and J. Haddon.
Nuts, manufacture of—3132—R. A. Brooman.
Oil cans—3215—W. J. Dixon.
Oils, obtaining purified, and obtaining oil cakes from cotton seed, &c.—3114—J. A. Pols and P. O. Bernard.
Ordnance and projectiles—3192—P. Gardner.
Ordnance and projectiles—3194—P. M. Parsons.
Oxygen gas, obtaining—3046—J. Robbins.
Paper, manufacture of—3169—A. Starck.
Paper collars—3261—S. S. Gray.
Paper pulp, &c., utilising the waste liquors resulting from the preparation of—3168—H. Chadwick and J. Clench.
Pearl grinding, &c.—3157—S. Edwards.
Presses for bending metal plates—3110—W. and J. Galloway.
Printing machinery—3039—W. E. Newton.
Printing machines, cylinder—3134—E. and W. Ullmer.
Pumps, rotary—3180—E. Myers and H. D. Cloag.
Punching apparatus, hudraulic—3176—E. R. Hollands.
Railway accidents, prevention of—3243—M. M. Twining.
Railway engines, carriages, &c.—3182—J. B. Fell.
Railway signals—3178—R. A. Brooman.
Railways, permanent way of—3122—C. Seaton.
Railways, permanent way—3267—R. A. Brooman.
Receptacles for containing biscuits—3075—T. Bate.
Rollers for calico printing—3040—T. Knowles.
Rolling roads, apparatus for—3216—W. Clarke and W. F. Batho.
Ropes—3190—W. Clarke.
Sacks, &c., without seam—2937—A. Simoneton.
Screw propellers—3100—W. L. and T. Winans.
Sewing machines—3211—C. T. Judkins.
Sewing machines—3271—J. V. Boesiger.
Ships' cooking and distilling apparatus—3156—R. A. Brooman.
Ships and floating batteries—3293—W. M. Peniston.
Signals for ships and railways—3208—F. N. Gisborne.
Soda and sulphuric acid manufacture—3044—J. Bowron and G. Robinson.
Spindles, &c., for spinning—3084—J. Wray.
Stamp for marking letters—3086—M. Guthrie.
Steam boilers, incrustation of—3076—W. C. Page.
Steam boilers, composition for covering—3082—H. B. James.
Steam boilers, apparatus indicating the level of water in—3186—W. Clark.
Steam engines and boilers—3212—J. Howden.
Steam engines—3140—R. A. Brooman.
Stringed instruments, arrangements for facilitating the teaching and playing of—2729—R. Brooks and C. Inwards.
Sunken vessels, raising—3142—J. H. Johnson.
Superphosphate of lime, manufacture of—3152—J. Wright.
Taps—3200—J. Macarthy.
Thrashing and screening grain—3052—R. Hornsby, jun.
Tow, &c., treatment of—3112—M. Friedlander.
Treating brine from salted flesh—3295—A. Whitelaw.
War rocket—3102—T. H. Fletcher and R. Forrest.
Washing textile fabrics—3062—J. H. Johnson.
Washing, wringing, and mangling machines—3128—N. Walton.
Window shutter—3193—T. Hyatt.
Wool combing—3074—E. Clifton.
Wool combing—3158—B. Fothergill.
Woven fabrics, apparatus for producing a superior finish upon—3173—J. M. Worrall.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Paper, manufacture of—7—C. Martin.

PATENTS SEALED.

1683. W. S. Bruce.
1687. W. E. Gedge.
1688. W. E. Gedge.
1689. S. Robinson.
1698. T. Preece.
1699. A. G. Southby.
1704. J. Thomas.
1706. J. Smith and S. A. Chease.
1709. R. A. Brooman.
1714. R. Agate.
1718. W. Tasker, jun.
1728. W. Henderson.
1731. R. and W. Hawthorn.
1736. J. Orr, J. Brinton, and J. Lewis.
1738. R. A. Brooman.
1740. J. Mortimer.
1749. R. A. Brooman.
1750. R. A. Brooman.
1763. E. Sonstadt.
1767. E. Funnell.
1770. W. T. Cheetham.
1771. W. Clark.
1796. F. Lepoutre.
1818. R. Weare.
1842. L. L. J. Fillion.
1872. A. A. A. Baron de Rostaing.
1895. J. P. Culverwell.
1914. B. W. Garland.
2389. W. Clark.
2394. W. Clark.
2678. J. Rawlings.
2781. H. Mege.
2818. E. Rowland.

From Commissioners of Patents Journal, January 12th.

PATENTS SEALED.

1760. J. Davison.
1766. J. Slater.
1768. T. Wimpenny.
1772. P. A. J. Dujardin.
1774. R. A. Brooman.
1777. D. Tamet.
1781. J.N. Tayler and W. Austin.
1784. L. R. Bodmer.
1785. C. Stokes.
1786. G. Rand.
1787. J. Lamb and S. Tovey.
1797. T. Johnson.
1801. R. Coenen.
1803. A. Clark.
1806. G. Murdoch.
1825. E. T. Bainbridge.
1828. R. A. Brooman.
1833. J. Ronald.
1839. J. Simmons.
1854. B. Birnbaum.
1915. J. Imbert, P. Bonnet, and J. Pfister.
1925. W. E. Newton.
1934. A. V. Newton.
1996. W. Clark.
2006. H. Brown.
2092. A. Jobson.
2093. L. Guillemot.
2151. A. V. Newton.
2300. H. C. Huskinson.
2441. S. Mathews.
2671. G. E. Donisthorpe.
2744. H. Bessemer.
2749. F. E. Tickels.
2766. T. C. Barraclough.
2834. J. W. Drummond.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

82. A. R. M. Normandy.
58. C. N. Leroy.
52. D. Adamson.
62. S. Moulton.
89. G. Whight.
88. W. Bullough.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

72. J. J. Russell & J.B. Howell.
214. P. H. Sharkey.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, JANUARY 22, 1864. [No. 583. VOL. XII.

Announcements by the Council.

THE SWINEY BEQUEST.

A meeting of the judges appointed under the will of the late Dr. Swiney to award, in concert with the Royal College of Physicians, on every fifth anniversary of Dr. Swiney's death, "a silver goblet of the value of £100, with gold coin in it to the same amount," took place on Wednesday, the 20th January, at the Society's House. The award was made in favour of Henry Sumner Maine, Esq., D.C.L., late Regius Professor of Civil Law in the University of Cambridge, and now Member of the Legislative Council of India, for his work on jurisprudence entitled, "Ancient Law." The cup has been executed by the Messrs. Garrards, from a design, made expressly for the Society, by Daniel Maclise, Esq., R.A.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

JAN. 27.—"On the Metric System of Weights and Measures, and its Proposed Adoption in this Country." By SAMUEL BROWN, Esq., F.I.A., F.S.S.

FEB. 3.—"On Instantaneous Engraving upon Metal." By Mons. E. VIAL (illustrated with experiments).

FEB. 10.—"On Fresco Painting, as a suitable mode of Mural Decoration." By J. BEAVINGTON ATKINSON, Esq.

CANTOR LECTURES.

Courses of Lectures on the following subjects will be delivered during the Session:—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. HASTINGS, Esq., Barrister-at-Law.

Fine Arts Applied to Industry. By W. BURGES, Esq.

Chemistry Applied to the Arts. By Dr. F. CRACE CALVERT, F.R.S.

The third and fourth lectures of Mr. Hastings' course will be delivered on Mondays, the 25th January and 1st February, at 8 o'clock; the subjects will be as follows:—

Contraband; its Nature and Usages.

Capture of Private Property at Sea; present State of the Law as modified by the Declaration of Paris; Arguments for and against its Continuance.

The Foreign Enlistment Act; its Operation on Commerce.

INSTITUTIONS.

The following Institution has been taken into Union since the last announcement:—

Hyde (near Manchester) Mechanics' Institution.

The Christmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

SIXTH ORDINARY MEETING.

Wednesday, January 20th, 1863; WILLIAM HAWES, Esq., Chairman of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Appleby, T. H., 30, Gracechurch-street, E.C.
Ashton, Thomas, J.P., Portland-street, Manchester.
Bartley, George C. T., South Kensington Museum, S.W.
Beauclerc, Capt. George, 23A, Grosvenor-street West, W.
Bickford, J. J., Tuckingmill, Cornwall.
Butler, James Robert, 4, Elm-street, Gray's-inn-road, W.C.
Cargill, William Walter, M.P., 4, Connaught-place West, W.
Cole, Alan Summerly, South Kensington Museum, S.W.
Cole, Lieut. Henry Hardy, R.E., Brompton Barracks, Chatham.
Corbould, Edward Henry, 10, Hyde-park-gate South, W.
Cross, William S., Park-street, Richmond, S.W.
Davies, John, 166, Queen-street, Portsea.
Del Rio, Patricio M., 130, Jermyn-street, St. James's, S.W.
Edwards, Rev. Allen T., M.A., 5, Kennington-terrace, S.
Fisher, George, The Woodlands, near Cardiff.
FitzGerald, Lord Otho, 8, Carlton-house-terrace, S.W.
Howell, George, 693, Old Kent-road, S.E.
Lawrence, Hugh M., Atlas Works, Manchester.
Lloyd, James Richard, Shrubbery, Belmont-hill, Lee, S.E.
Mackinlay, D., 42, Clarges-street, Piccadilly, W.
Martin, Louis Emile Constant, Chateau Boujeon, Rue Balzac, Paris; and 32, Albany-street, Regent's-park, N.W.
Masters, M., 1, Paragon-place, New Kent-road, S.E.
Moser, John, 165, High-street, Southwark, S.
Owen, Philip Cunliffe, South Kensington Museum, S.W.
Oxland, Robert, F.C.S., Empire City, Nevada Territory, America.
Rodgers, Rev. John, 17, Mecklenburgh-square, W.C.
Sale, Colonel Thomas Henry, 27, Westbourne-park, W.
Sturgeon, John, Pease's-buildings, Leeds.

Thicke, Charles James, 17 and 18, New Bridge-street, Blackfriars, E.C., and Rosendale, Dulwich, S.E.
Walker, Mowbray, Millwall Iron Works, E.
Wolff, Lewis, 15, Albert-square, Clapham, S.

The following candidates were balloted for and duly elected members of the Society:—

Attwood, Matthias Wolverley, F.R.G.S., Dulwich S.
Bowyer, Rev. W. N. Wentworth A., Rectory, Clapham-common, S.
Brown, Henry, Ettrick Mills, Selkirk, N.B.
Cotton, Charles P., 11, Lower Pembroke-street, Dublin.
Cutler, Joseph, 4, Pollington-villas, Holloway-road, N.
Ellis, Wynn, 30, Cadogan-place, S.W.; Ponsbourne-park, Hertford; and Tankerton, near Canterbury.
Forbes, H., 6, Aberdeen place, Maida-hill, W.
Hanson, Reginald, 43, Upper Harley-street, W.
Hardwicke, Robert, 192, Piccadilly, W.
Johnson, William, 188, Tottenham-court-road, W.
Kiessler, T., 18, Spencer-street, Goswell-road, E.C.
Lumley, Henry, 4, Guildford-place, Russell-square, W.C.
Maynard, Henry, Oakfield-lodge, Hawkhurst Kent.
Mercer, Thomas, 45, Spencer-street, Goswell-road, E.C.
Needham, John, Albert Iron Works, Warrington.
Nicholson, W. W., 17, King-street, Cheapside, E.C.
Shand, James, Upper Ground-street, Blackfriars, S.
Southorn, Edwin, Broseley, Salop.

The Paper read was—

ON THE INJURIOUS EFFECTS OF SMOKE ON CERTAIN BUILDING STONES AND ON VEGETATION.

By Dr. Augustus Voelcker, Consulting Chemist to the Royal Agricultural Society of England.

The subject on which it is my privilege to address my audience to-night is, it will be conceded by all present, of great practical importance. This must be the plea for my venturing to speak on a matter which has been discussed with great ability in this room on a former occasion. Not having any intrinsically valuable discovery of my own to bring forward, nor to communicate a plan more effectual than any of the numerous devices which have been recommended for preventing the decay in building stones, I have to crave your kind indulgence in appearing before you to-night. I trust, however, my observations and the experiments on which they are based will not be altogether void of interest, and may lead to a useful discussion on the part of others, so much better qualified than myself to speak on the subject.

Much has been said and written on the causes of the rapid decay to which some building stones are liable. Chemists, mineralogists, architects, builders, and other scientific and practical men have on various occasions devoted a good deal of time and painstaking labour to investigations, purporting to trace the beginning and progress of this decay, and to discover, if possible, the means of preventing the injury which calcareous building stones sustain under the influence of the atmosphere. Their labour has not been altogether unsuccessful, and several suggestions, of more less value, have been made, which are well calculated to mitigate, if not to prevent, the evil. Still our information on the true character of the decay in particular stones is but scanty, nor are the means of preventing decay in buildings so perfect as not to call for further improvements.

Every addition to our knowledge of the causes of decay in stones has a tendency to bring within easier reach the appropriate remedy. At all events, a more comprehensive knowledge on this subject in stones will help us to discriminate with more certainty between good and bad stones, and to avoid the employment of building materials which, although they stand the influence of the weather very well in the open country, are nevertheless unfit for particular parts of a building, and cannot be used with safety in some localities. Having been engaged for some time past in examining the characteristic black crusts which are frequently seen on buildings erected of Bath and similar oolitic limestones, my attention was specially directed to the study of the nature of the decay which attacks with great energy some kinds of calcareous stones, and I have come to the conclusion that the injury which the smoke of towns exerts on Bath stone, magnesian limestone, and other calcareous building stones, is far more pernicious in its results than it is generally believed to be. It will, therefore, devolve upon me to direct your attention particularly to the changes which such stones undergo under the influence of a smoky atmosphere, such as we find in most towns.

In every day life we usually understand by smoke, the black and more or less tangible impure air which rises from the chimneys of fire-places and furnaces in which the combustion of the fuel is imperfect, in consequence of which some finely-divided carbon and a variety of gases are thrown into the air.

That this black smoke exerts an injurious influence on building stones and on vegetation, is admitted in a general way, but I have no hesitation in saying that the extent of the injury done by the smoke that at times obscures the sky in our crowded cities has not been fully recognised. This, perhaps, is the reason why the precise chemical changes produced by accumulations of soot on limestones and calcareous sandstones have not been studied with sufficient minuteness.

Before giving an account of my analytical experiments on the effect of smoke on oolitic limestones, a few general observations on the nature of the decay in stones may not be out of place.

Building stones in general may be divided into two classes:—

1. Stones which, like granite, porphyries, and most sandstones, are not easily acted upon by acids.
2. Stones which, like limestones, dolomites, and some kinds of calcareous sandstones, are composed of materials that are partially or entirely attacked by acids with facility.

Building stones belonging to the second class are much more liable to suffer injury by atmospheric agencies than those belonging to the first class; and as, moreover, limestones and dolomites are principally employed for ornamental buildings, the investigation of the causes which lead to their decay possesses a special interest.

The conditions under which calcareous stones decay when placed in a building, are partly mechanical and partly chemical. The absorption of moisture by porous stones, and the disintegration to which it leads in consequence of the resistless expanding force of water in becoming ice in cold weather, are illustrations of a purely mechanical cause and effect, which frequently manifest themselves in limestones used for building purposes. The changes produced on building stones by carbonic acid and the sulphur compounds in the air of towns, are instances of chemical reactions, which may be seen in their results in some cases as distinctly as the results of purely mechanical force, to which allusion has just been made. Building stones of a loose or irregular structural composition are of course more liable to suffer injury from the absorption of moisture than hard, compact, and crystalline stones of the same or similar composition. The more readily a specimen of Bath or Caen stone is affected by mechanical agencies the more easily it will be found to be acted upon by chemical reagents. It will not, therefore, be necessary, nor indeed desirable, to examine separately the mechanical and the chemical conditions of decay. I would, therefore, notice together the physical and the chemical effects likely to be produced in calcareous building stones by the different constituents of the atmosphere.

Of the normal component parts of air, oxygen, moisture, carbonic and nitric acid have to be regarded as probable agents of destruction. The abnormal or ac-

cidental constituents of the air of towns are certain sulphur acids, soot, and occasionally hydrochloric acid. These accidental impurities require particular examination, as they are really more pernicious in their effects upon building stones, as well as on vegetation, than the normal constituents, which, it need hardly be observed, exert no injurious influence upon vegetation.

The action of oxygen is of comparatively a subordinate character, its effects being confined to constituents usually absent or occurring only exceptionally, and in but small quantities in limestones and dolomites. In calcareous sandstones sulphides of iron and protoxides of iron and manganese are occasionally found, and as these compounds are very prone to absorb oxygen, and the higher oxides thus formed are more voluminous than the original protoxides, such stones are subject to the disintegrating action of atmospheric oxygen. Of far greater importance are the effects of moisture. Water, either in the shape of vapour or liquid, perhaps is the most powerful agent of destruction that displays itself in the gradual crumbling down of calcareous stones. Porous and soft stones of that kind should never be employed for parapets, window-sills, weather beds of cornices, strings, plinths, or other parts of a building where water may lodge. The changes which water produces in porous stones exposed to drip and alternations of a wet and dry condition appear to be less of a chemical than a mechanical character.

Water is subject to expansion on sudden alterations in the surrounding atmosphere, and the irresistible force it then exerts, necessarily exercises a disintegrating action. If the temperature sinks below the freezing point, this destructive action is most powerful, since water in becoming ice suddenly and greatly expands. But even above the freezing point, the expansion of water at a sudden elevation of temperature appears to me to exert, upon porous building materials, a mechanical force sufficiently powerful to account for their gradual decay, at seasons of the year when it cannot be referred to the formation of ice within the pores of the stone. There can be no doubt that all stones which possess in a high degree the property of absorbing moisture, are unfit for building purposes. Certain kinds of porous limestones and sandstones, differing widely in composition and in relation to their liability to become attacked by acids, are alike subject to this disintegrating action, thus indicating plainly that their decay is not the result of the chemical action of an atmospheric constituent, but the result of the mechanical action which water exerts on all porous and absorbent materials, no matter what their composition may be.

Such stones, it will be readily conceived, must be very liable to crumble down in our moist and changeable climate. In towns, and in the country in sheltered or in exposed parts, on the outside or the inside of buildings, and in short under the most varied conditions, the decay will proceed steadily when it has once begun to show itself in porous and absorbent stones. The fact that these building stones decay as readily in open country places as in towns, has led some men to entertain the opinion that the impurities present in the air of towns and in the immediate neighbourhood of manufacturing districts, have nothing to do with the gradual disintegration to which oolitic and other calcareous building stones are subject. But although it is quite true that some building stones do not require to be exposed to the injurious effects of the atmospheric impurities of crowded cities in order to decay, it is no less certain that there are others which stand wind and weather well in the country, but are more or less readily attacked by atmospheric influences when employed in the erection of town residences.

The fact is, the structural composition of some stones is so irregular, and radically bad, and their absorbent powers of moisture so great, that they are alike unfit for the erection of buildings in town or country, whilst there are others possessing sufficiently good physical characters to resist the mechanical effects of water, to which reference has been made, and remaining sound in a comparatively speaking pure air, but which are not of such a chemical composition as to be capable of withstanding the pernicious chemical influence of a less pure town atmosphere.

Carbonic acid is a never-failing constituent of the air, and consequently is present also in rain-water. Much stress has been laid on the dissolving action of rain-water, but it appears to me this action has been greatly overrated. Instead of practical proofs, showing that water charged with carbonic acid really exerts a powerful disintegrating influence upon calcareous stones, merely theoretical reasonings have been advanced in support of that opinion.

It is true, water charged with carbonic acid in contact with carbonate of lime or magnesia gives rise to soluble bicarbonates, but even were the quantity of bicarbonate of lime or magnesia much greater than it actually is, the mere removal of a trifling portion of lime from the surface of the stone, does not, I take it, explain the peculiar exfoliation and corroded appearance which many oolitic building stones present to our view. Calcareous stones, exposed to the long-continued dissolving action of water containing carbonic acid, exhibit rather a smooth and not a corroded appearance.

In the next place we have to consider the effects likely to be produced by the small quantities of nitric acid which are invariably present in the atmosphere. The proportion of nitric acid in the air is so minute that it may be questioned whether these minute traces have any marked influence on our buildings. With respect to the supposed corrosive action of the nitric acid of the air, and the formation of nitrates in limestones, I made some experiments, a brief account of which may here find a place. A few years ago my attention was directed to the decay of the oolite limestone of which the lodge at one of the entrances at Badminton is built. This stone was quarried at a place about two miles from Badminton, and, like all Bath stone, is not very hard. The stone protected by the porch of the lodge I found in a more advanced state of decay than that freely exposed to wind and weather. Blocks from under the porch and the exposed part of the lodge were obtained and examined by me for nitrates. Of each block a portion of the exterior side in contact with the air, and the interior side touching the remainder of the thick walls of the lodge were examined separately, and the following results were obtained, by adopting Dr. Pugh's accurate method for determining minute quantities of nitric acid:—

No. 1. Stone from under the porch of the lodge—

	Per centage of nitric acid.	Mean.
a. Interior side	·1786	·2256
b. Exterior side	·2726	

No. 2. Stone unprotected by the porch—

a. Interior side of the stone	·1269	·1480
b. Exterior side exposed to the air..	·1692	

It will be seen that both blocks contained small quantities of nitric acid, which probably is a never-failing constituent of calcareous stones. It will also be observed that the stone protected by the porch contained rather more nitric acid than that freely exposed to the weather, and likewise that the external side of both blocks contained somewhat more nitric acid than the interior sides. These results agree well with what may be expected to take place under the different conditions in which the several portions of the stone were found. The sides in contact with the air might naturally be expected to contain more nitric acid than the inside not so thoroughly penetrated by the air, and the circumstance that less nitric acid was found in the stone not protected by the porch, is probably explained by the removal of some of the soluble nitrates by the rain striking against the exposed surface. It has been stated already that the protected stone was more affected by decay than that not protected by the

porch of the lodge. Thinking it just possible that the two blocks might differ in composition, I analysed a portion of each, and obtained the following results:—

	No. 1. Limestone under porch.	No. 2. Limestone unprotected.
Moisture	1·46	·81
Oxides of iron and alumina	·98	1·81
Phosphoric acid	·14	·18
Carbonate of lime	93·91	94·64
Sulphate of lime	1·34	1·24
(Containing sulphuric acid)	(·79)	(·72)
Magnesia	·73	·77
Nitric acid	·225	·148
(Mean of the two determinations.)		
Insoluble siliceous matter	·97	·95
	99·755	100·548

The differences in the chemical compositions of the two stones are too trifling to account for the greater injury which that protected by the porch had sustained; nor do I think it at all likely that the small quantities of nitric acid which were found had anything to do with the decay of the stone. For confirmation of this the following result may be mentioned:—One of the stones was kept as a specimen in a damp room for rather longer than a year, during which period a considerable portion crumbled down to a coarse powder. In the expectation of finding the process of nitrification to have caused the disintegration of the stone, I made a careful nitric acid determination in this powder, and was disappointed in not obtaining more than ·192 per cent of this constituent, showing that the proportion of this acid had not sensibly increased, and that the crumbling down of the stone was not connected with an increased nitrification, but more probably the result of the dampness of the room in which the specimen was preserved. Here then we have an example of a limestone crumbling down by degrees solely under the influence of damp. There was no deposition of soot on the stone, and no chemical action of any of the constituents of air, except moisture, could be observed to have taken place.

In the next place the foreign or accidental impurities of the air of towns will have to be considered.

The quantity of sulphur-acids in the air of towns is quite appreciable. The quantity of coals consumed in London for domestic and manufacturing purposes exceeds three million tons per annum, and as all coals contain sulphur, the greater portion of which is discharged during their combustion as sulphurous and other sulphur-acids, an enormous quantity of these destructive acids must find their way into the air. No numerical data exist with regard to the proportion of sulphur-acids in the London atmosphere, but, according to Dr. Angus Smith, the air of Manchester contains an average proportion corresponding to one part of sulphuric acid in every 100,000 parts of air, which, in the centre of the town, rises to 25 parts in 100,000. According to the quality of the coal and the amount consumed in a given space in a given locality the proportion of sulphur-acids in the air of towns will vary. In some places it may, no doubt, be greater, in others less than in the air of Manchester, but under all circumstances it will be sufficiently large to cause serious apprehensions.

The strong affinity of sulphuric acid for lime and magnesia render it a destructive agent for calcareous building stones. Sulphuric acid not only renders soluble these earthy carbonates, but, forming with lime gypsum, a compound which contains in round numbers 20 per cent. of water of crystallization, and with magnesia the well-known sulphate of magnesia, a salt remarkable for the large proportion of water of crystallisation which it fixes, it gives rise to a mechanical destruction of Bath stone and magnesian limestones similar in every respect to that produced by freezing water. The efflorescences of sulphate of magnesia which have been noticed upon those portions of magnesian limestones where exfoliation has taken place, afford a practical proof of the destructive action of the sulphuric acid that occurs in the air of towns. Hydrochloric acid occasionally has been found in the air of towns. It is, however, not a usual impurity; and as on the 1st of January the act passed in the late session for the more effectual condensation of muriatic acid gas in chemical works came into actual operation, and there is no practical difficulty in securing the condensation of this gas, no fear need be entertained that the buildings in towns will be affected by hydrochloric acid fumes.

Still more pernicious in its influence than the free sulphur-acids which exist in the air of towns, I have reason to believe is the black smoke which deposits soot, to the great disfigurement of our public and private buildings. The soot deposit is particularly destructive to the carved portions of buildings. In order to render intelligible the peculiar chemical action which smoke exerts on calcareous building stones, I beg to invite attention to the following analysis of a sample of ordinary house-coal soot, which I made many years ago. In 100 parts of soot I found:—

Moisture	10·620
Organic matter (chiefly black carbon)	44·736
Chloride of ammonium	·933
Sulphate of ammonia	3·580
Chloride of sodium	·231
Chloride of potassium.	·503
Oxides of iron and alumina	15·691
Sulphate of lime	11·051
Phosphate of lime	·530
Carbonate of lime	1·129
Lime in a state of silicate	2·290
Magnesia in a state of silicate	·389
Soluble silica	4·014
Insoluble siliceous matters	4·159
	99·856

The per centage of sulphate of ammonia in different samples of soot I find varies exceedingly. In some samples I have found as much as ten, twelve, and even more of sulphate of ammonia. Perhaps 5 or 6 per cent. represents better the average quantity of ammonia than the figures in the above analysis. Soot is essentially a mechanical mixture of finely-divided carbon with sulphate of ammonia, some sal ammoniac, and fine particles of coal-ashes. Soot, it need hardly be remarked, is a constituent of the smoky atmosphere of towns, and is calculated to do great injury to the ornamental work of buildings executed in Bath stone or magnesian limestone. The most destructive agent of such a smoky atmosphere, as far as calcareous building stones are concerned, I am inclined to think is the sulphate of ammonia, which, as has been shown, is a constant constituent of soot. This conclusion has been forced upon me by the examination of the sooty deposit found on a magnificent church in a large commercial and manufacturing town. This church is built of an oolitic limestone found in the neighbourhood, and on account of the increasing decay, which has quite disfigured the structure, and in many places effaced the finer delineations of the carved work, is now under the process of restoration. On some of the older parts of the church the corrosive agents of a smoky atmosphere appear to have penetrated the stone to a considerable depth. The stone here appears to be covered with black crusts, varying in thickness from half an inch to more than an inch and a half. These crusts crumble off spontaneously from time to time, or can be easily removed by the application of a slight pressure. I have placed upon the table specimens of crusts similar to those which I made the subject of a rigorous analysis, with a view of ascertaining the changes the original building stone evidently had undergone under the influence of a smoky atmosphere,

and I was perfectly amazed to find how radically the original composition of the stone had become changed, and was left in no doubt as to the origin of the black crusts.

The church on which these crusts occur is built with a good limestone, composed chiefly of carbonate of lime, with no more sulplate of lime, magnesia, oxide of iron, and insoluble siliceous matters than generally occur in the better descriptions of oolitic limestones, as will be seen by the following analysis:—

Water driven off at 212°	·230
Water of combination	·110
Carbonate of lime	97·690
Sulphate of lime	·153
Magnesia	·470
Protoxide of iron	·540
Alumina	·120
Soda	·044
Potash	·296
Insoluble siliceous matter (silica)	1·350
	101·003

In the course of years this stone becomes covered, as has been already stated, with a dark-coloured incrustation, which increases in depth from year to year. These black crusts are soluble to a large extent in water; in some specimens I found as much as two-thirds soluble in water and only one-third insoluble. Dried at 212° they yielded the following results:—

Portion soluble in water	65·94	
Sulphate of lime		51·23
Sulphate of magnesia		1·61
Chloride of sodium		·47
Water of combination		12·63
Portion insoluble in water	34·06	
Organic matter (black carbon)		5·72
Oxides of iron of alumina		2·57
Carbonate of magnesia		·10
Carbonate of lime		19·03
Insoluble siliceous matter		6·64
		100·00

A comparison of the composition of the crusts with that of the stone upon which they were found deposited, suggests the following remarks:—

1. The greater part of the carbonate of lime, which is the chief constituent of the stone, has become changed into sulphate of lime. Sulphate of lime and water of combination are given separately in the preceding analysis, both having been obtained by direct and separate determinations. Uniting the two together we have no less than 63·86 per cent. of hydrated sulphate of lime; and only 19 per cent. of carbonate of lime escaped transformation into sulphate.

2. Nearly the whole of the magnesia in the crusts is present as sulphate of magnesia, whilst it occurs in the stone as carbonate.

3. The crusts contained in round numbers 5¾ per cent. of black carbon, showing that a large proportion of soot must have come into actual contact with the surface of the stone.

4. Both the amount of oxides of iron and insoluble siliceous matters in the black deposit is very much greater than in the original stone. An examination of the insoluble siliceous matter has shown that it is of the same nature as the siliceous matter of coal-ashes. The fine particles of coal-ashes, it thus appears, are carried into the air along with the carbon and other constituents of soot and deposited on the more sheltered portions of buildings. It has been shown before that house-coal soot contains a considerable proportion of oxides of iron and alumina and insoluble siliceous matters in the shape of fine coal-ashes. The occurrence of fine coal-ashes in the black crusts thus shows that soot, of the same general character as house-coal soot, was deposited on the stone.

In soot the amount of sulphate of ammonia is considerable, and as the black deposit on the stone shows plainly the presence of other soot constituents, appreciable quantities of sulphate of ammonia might likewise be expected if this salt did not act upon carbonate of lime in the presence of moisture. I have examined several deposits on calcareous stones, but never found more than mere traces of ammonia. The sulphate of ammonia in the sooty deposit in contact with water and the calcareous stone evidently becomes transformed into volatile carbonate of ammonia which escapes and sulphate of lime which remains behind. There can be but little doubt that such a chemical reaction takes place when a smoky atmosphere comes into contact with a calcareous stone, especially if the stone is porous, non-crystalline, and exposed to damp. The dampest, most sooty, and more sheltered parts of buildings are generally much more affected by decay than the more exposed parts. Now this would not be the case if the gaseous constituents of the air were the chief cause of the exfoliations on limestone buildings, for if this were so, I imagine the most exposed parts of such buildings would be more easily attacked than the less exposed. But if the corroding action of the air of towns is, as I believe, more properly ascribed to the tangible portions of soot, it admits of a ready explanation why exactly the sheltered and damper portions of a building are more liable to decay than other parts. In the first place it is evident that soot will be more abundantly deposited in the crevices of fine ornamental stone-work, or in places sheltered by protruding cornices, than on a plain surface wall, freely exposed to wind and weather; in the next place, it has to be borne in mind that, according to a well-known law in chemistry, chemical reactions do not generally take place except the materials which act upon each other are in the most intimate contact, which necessitates either fusion or solution of at least one of the constituents.

In a dry position soot does not produce so injurious an effect as in a damp place, where the sulphate of ammonia contained in it is dissolved by degrees, and retained in solution in the porous stone. Acting upon its carbonate of lime, it will produce sulphate of lime and carbonate of ammonia. In a damp and sheltered position, the conditions for the display of this decomposing action of sulphate of ammonia are evidently more favourable than they are in a more exposed part of a building, where rain will wash away the sulphate of ammonia of soot before it has time to act upon the stone, and the wind in a great measure will prevent altogether large accumulations of soot.

The sulphate of lime produced by the action of sulphate of ammonia upon limestones in the presence of moisture, it is hardly necessary to observe, takes up water of crystallisation, and thereby leads to the exfoliation of the stone. The longer the action of a sooty atmosphere continues upon limestones, the more complete will be their decomposition. In old and thick crusts, like those examined by me, we have seen that more than 60 per cent. of gypsum may occur. Had I merely analysed the surface of the crusts, I doubt not a still larger proportion of sulphate of lime would have been found.

In another specimen of a black limestone deposit from a public building, I found:—

Hygroscopic water	1·07
Organic matters (chiefly fine carbon)	5·29
Hydrated sulphate of lime	56·10
Carbonate of lime, oxides of iron, alumina, etc. (determined by difference)	34·11
Insoluble siliceous matter	3·43
	100·00

The proportion of ammonia in this incrustation amounted to only ·04 per cent., and that of nitric acid to ·115, which is equal to ·174 of nitrate of lime. Here, again, it will be noticed the sulphate of ammonia of the soot has almost entirely disappeared, and given rise to no less than 56 per cent. of hydrated sulphate of lime.

The effect of a smoky atmosphere on Caen stone is very injurious, particularly if the stone is porous and hygroscopic. I have lately had an opportunity of noticing

the rapid decay of Caen stone employed in the restoration of a church. The decay showed itself in less than three years, and was proceeding with such rapidity that this stone had to be abandoned in the work of restoration.

Specimens of this Caen stone, and incrustations formed upon it under the influence of the smoky atmosphere of large manufacturing town, are placed on the table; also specimens of the stone which is now employed, and which resists better the injurious action of such an atmosphere.

The analysis of the incrustation on the Caen stone yielded the following results:—

Hygroscopic water	1·56
Organic matters (carbon chiefly)	4·54
Hydrated sulphate of lime	41·78
Carbonate of lime	38·93
Carbonate of magnesia	·58
Oxides of iron and alumina	·33
Insoluble siliceous matter	11·01
Alkalies and loss	1·27
	100·00

The amount of alumina in the deposit was only ·038. A nitric acid determination gave ·246 per cent, which is equal to ·371 of nitrate of lime.

Although this deposit was comparatively speaking of recent production, it nevertheless contained a large proportion of hydrated sulphate of lime. Hard crystalline limestones of course resist the action of smoke better than porous soft stones, but it may be questioned whether any description of limestone is well adapted for delicate ornamental out-door work in a smoky town. If the evil of a smoky atmosphere cannot be entirely avoided in places like London, Manchester, Birmingham, &c., every care should at least be taken to mitigate as much as possible the smoke nuisance.

It is not my intention to examine the various methods which have been proposed to render calcareous building stones less liable to decay, for my chief object to-night was to bring before your notice an account of experiments which I made in studying the remarkable chemical changes which oolitic limestones undergo under the influence of a smoky atmosphere. I cannot, however, refrain from saying, that, of all the different plans of protecting buildings against decay, Mr. Ransome's appears best to fulfil the requirements of the case. In the first place, it may be observed, a remedy against decay in stones should have a tendency to render porous stones more impervious to water and atmospheric impurities; and, in the second place, such a remedy should alter the surface of a stone which is so readily attacked by smoke as limestones generally are, in a manner that, instead of carbonate of lime, a compound of lime is produced on the surface which is not readily acted upon by sulphate of ammonia or by acid fumes which are found occasionally in the air of towns. Mr. Ransome's patent process appears to fulfil perfectly the first requirement—that of making a porous stone harder and more compact. The principle adopted in this process likewise appears to be correct, and in a great measure to fulfil our second requirement, for by first impregnating a limestone with chloride of calcium, and saturating it afterwards with a solution of silicate of soda, Mr. Ransome closes the pores of the stone and fills them up with insoluble silicate of lime, a compound which is not acted upon readily by chemical agents. By surrounding the particles of carbonate of lime of which the porous stone consists with insoluble silicate of lime, it will be readily conceived the surface of the stone must be rendered far less liable to be acted upon by atmospheric agencies than the stone in its unprepared state. The perfection of this process would be, if, by some means or other, not only the pores of calcareous building stones could be filled up with a compound, which, like silicate of lime, is not easily acted upon by chemical agencies, but if an appreciable portion of the surface of the stone itself could be changed from carbonate into silicate of lime or into some other equally well-resisting compound, and at the same time the production of soluble salt-like chloride of sodium could be avoided.

In conclusion, I beg to offer a few observations on the injurious effects of smoke on vegetation. Wheat, barley, grass, or clover, exposed to a smoky atmosphere at an early stage of their growth, are visibly affected in a short time. The tops of these plants turn first red, then yellow, and finally white, and an effect is produced not unlike that caused by frost or excessive drought. Corn crops affected in this manner by smoke may recover to a certain extent, but they never yield well, inasmuch as the development of the plants becomes irregular, and the corn ripens unequally. If cereals are attacked by smoke when in flower, the ears do not fill well, and the grain is of a poor quality.

Grass and clover, more or less discoloured or bleached and damaged by smoke, are disliked by cattle, and often rejected by them altogether. Smoke deteriorates the quality and diminishes the quantity of grass and clover crops. Plants with strongly developed leaves, for instance, mangolds, swedes, turnips, and other green crops, are less liable to suffer injury from a smoky atmosphere.

Fruit and ornamental trees, on the other hand, are readily affected by such an atmosphere. The leaves turn yellow, brown, and finally black, and then drop. If the leaves are destroyed two or three years in succession the trees become sickly, and finally die off. Fruit-trees in blossom attacked by smoke yield no fruit, or but a poor sickly crop.

During the combustion of coal much sulphurous acid is generated, which is carried away by the smoke of the fire. The injurious effects of smoke on vegetation are evidently due to sulphurous acid, a gas which, according to experiments made many years ago by Turner and Christison, causes the leaves of plants to drop when it is present in air merely in the proportion of $\frac{1}{10000}$th part.

Recently experiments on the effects of air containing small quantities of sulphurous acid upon vegetation have been made in Germany, by my friend Prof. Stöckhard of Tharand. Young fir-trees exposed twice or three times, for two hours, to air containing only $\frac{1}{20000}$th, or even $\frac{1}{50000}$th of sulphurous acid gas, were completely bleached in wet weather, and killed when they were exposed for a longer time to air containing so small a quantity of sulphurous acid.

In dry weather a much larger quantity of this acid may be present in the air without doing any injury to plants. It is in wet weather that air containing only traces of sulphurous acid is injurious to vegetation. In localities where much coal of inferior quality, generally rich in iron pyrites, is burned, the injury done to vegetation by the sulphurous acid proceeding from such coal may often be seen at a distance of from one to two miles from the place where the smoke is generated.

Farmers residing in a neighbourhood where brick-kilns and potteries abound, frequently sustain much more injury than they are themselves aware. The quantity of sulphurous acid emanating from open brick-kilns is very considerable, and there cannot be any doubt that, in certain localities, the air is poisoned with sulphurous acid gas to an extent which prevents the healthy growth of wheat, barley, or oats, so that good crops are rarely seen in such localities, and blighted ones are quite the rule.

By a recent Act of Parliament provision is made for the effectual condensation of muriatic acid gas in alkali works; but, as far as I know, there is no law which prevents brickmakers throwing into the air any quantity of sulphurous acid which they choose, although it is more pernicious to vegetation than even muriatic acid gas. I have had many opportunities of becoming practically acquainted with the injurious effects which a smoky atmosphere produces on our cereal crops, and regard a strong deposition of soot on wheat and other corn crops quite a sufficient evidence of the more or less complete injury which the crops must have suffered by the sul-

phurous acid always present in the air in districts where such sooty deposits are seen on plants. The disadvantages of carrying on agricultural pursuits in the potteries, or in districts where volumes of black smoke discharge enormous quantities of sulphurous acid into the air, are well-known amongst the more intelligent and enterprising farmers. This fact explains to a certain extent the backward condition of agriculture in such localities, and loudly calls for a mitigation of the evils to which farmers are exposed who have the misfortune to occupy land in the immediate neighbourhood of large manufacturing towns, or in localities where immense quantities of inferior coal are consumed by brick and tilemakers and manufacturers of earthen and stoneware, &c. Again, in districts where copper-ores, consisting for the greater part of the sulphurets of copper or iron, are the raw materials from which copper-smelters extract the metal, enormous quantities of sulphurous acid are discharged into the atmosphere.

The injury done to vegetation by the smoke from copper-works has been traced beyond a distance of four miles. It is true the smoke from such works generally contains appreciable quantities of arsenic, which of course is inimical to the health of plants; but as the arsenical fumes are insignificant in quantity in relation to the large amount of sulphurous acid which is produced in roasting copper-ores, and as air containing $\frac{1}{400000}$th or even $\frac{1}{800000}$th part of sulphurous acid gas is decidedly injurious to vegetation in wet weather, I think the sulphurous acid of copper-smoke does more mischief to the crops in the neighbourhood of the works than the arsenical compounds of the smoke. Just as little as alkali-makers are permitted to discharge muriatic acid into the air, should copper-smelters be allowed to discharge into the air the enormous quantities of sulphurous acid which are produced in roasting certain copper-ores. It may perhaps not be possible to condense sulphurous acid so perfectly or so readily as muriatic acid gas, and probably the arrangements for the condensation of the former will be found altogether inappropriate to effect the condensation of the latter, but attempts to mitigate the evil resulting to vegetation by sulphurous acid fumes should be seriously undertaken.

It has occurred to me that the sulphurous acid fumes of copper-works might, perhaps, be converted economically into sulphuric acid, or be used for the production of sulphite or hyposulphite of soda; and I do not consider it improbable that one of these days this highly injurious product will cease to be a nuisance to the inhabitants of the country round about the works, and be turned to good economical account.

As regards the actual quantities of sulphurous acid gas contained in the smoke of brick-kilns, we possess no data for our guidance. The quality of the coal used, the construction of the kiln, and the composition of the clay of which the bricks are made must affect to a great extent the proportion of sulphurous acid in the smoke. Thus a coal, with a high per centage of sulphur, but containing also much mineral matter, may produce on burning less sulphurous acid than another kind of coal, poorer in sulphur and in mineral matter, inasmuch as the greater portion of the sulphur is fixed by the mineral portion of some coals. Again, if the clay contains magnesia or lime, or is purposely mixed with chalk, most of the sulphur of the coal will be fixed by the magnesia or lime.

The brick-makers in the neighbourhood of London, who use with the clay a considerable proportion of chalk, therefore produce a smoke which contains but very little sulphurous acid, whilst in districts where fire-bricks, tiles, &c., are largely manufactured from clay that does not contain lime or magnesia, or merely insignificant quantities, the air becomes charged with sulphurous acid to an extent which injuriously affects the vegetation for miles round the brick-clamps or kilns.

Before sitting down allow me briefly to recapitulate the chief points of interest which I have laid before you.

The decay of building stones is connected with much that appears inexplicable or contradictory; I therefore confined my attention to the study of the changes which Caen stone, Bath-stone, and similar calcareous building stones undergo under the influence of a more less impure air.

I endeavoured to show that some—perhaps a good many—calcareous building stones rapidly decay, simply because they are too porous and absorbent, or not of a sufficiently good structural composition to withstand the mechanical effect produced by the expansive force of water. The great enemy to all such stones, and the most important cause of their decay, is damp. It was shown that in such decaying or decayed porous stones the amount of nitrate of lime is too insignificant to attach to it any material influence in producing the exfoliation on limestone buildings. The normal constituents of the air, except moisture, do not appear to exercise any very marked chemical effect upon calcareous building stones.

In the next place, I showed that the destruction of the ornamental work of buildings executed in Bath, Caen, or a similar calcareous building stone, is caused by the formation of crystallised sulphate of lime on the surface. The crusts that may be seen in perfection on limestones covered with soot, were found to consist principally of crystallised sulphate of lime, mixed with the constituents of ordinary house-coal soot, and more or less undecomposed carbonate of lime.

I endeavoured to show that the work of destruction is chiefly caused through the agency of smoke, and pointed out that the active agent of black smoke is sulphate of ammonia, a salt which in the presence of moisture transforms carbonate of lime into crystallised sulphate of lime (the preponderating constituent of the incrustation of calcareous building stones) and into volatile carbonate of ammonia, which escapes.

Finally, I directed attention to the injury which a smoky atmosphere does to vegetation, and pointed out sulphurous acid as the cause of this injury.

It now remains for me to express the wish that some gentlemen in the room, well qualified to speak on the subject brought forward by me, will favour the meeting with suggestions that may ultimately lead to a remedy for, or the mitigation of an evil, the existence of which is but too apparent, and some of the causes of which I have endeavoured to point out.

DISCUSSION.

Mr. C. H. SMITH said his remarks would be of a practical rather than of a scientific nature. He had often been perfectly bewildered by the many scientific theories that had been propounded in reference to this subject. The paper had not alluded to the great variation in quality even in the same description of stone. As regarded Caen and Bath stones, they had been treated as being usually of one quality, whereas it was well-known that in every quarry of this stone there were four or five different varieties, as distinct from each other as possible; therefore it was not right to treat of it merely as Caen stone. The same might be said of Bath, Portland, and all the other oolitic stones. If it were left to the builder or mason, he would soon find out the softest in the quarry, for it could be worked with half the labour that was required for the harder kinds, besides making the finest looking work when it was finished; and it was owing to this often occurring that an almost incredibly rapid decay of the material took place. In every district of the Caen stone there were eight or ten different quarries, and each of these had five or six different beds, so that there were at least fifty varieties of Caen stone, all varying in some respects from each other, and many of them of an inferior character. The decay of the stone in building was therefore in a great measure owing to the bad selection of the material in the first instance. He had seen many instances of this both in London and the country. He could mention many public and other buildings in London and elsewhere, in which the decay

of the stone had been almost as striking as in the case of the specimens on the table. The Roman Catholic Church at St. George's was almost as bad as it could be. The structure had been built within the memory of most present, and yet the stone was in a complete state of decay. The materials used were Caen and Bath stone, but not of good quality, and it was therefore, in his opinion, more important to be able to select the best qualities of stone than simply to ascertain their chemical constituents. Generally speaking, the stonemason could tell almost at a glance the good and bad qualities of stone, but it was often not his interest to say anything about it. To give an instance of good and bad qualities of stone of the same kind, he would mention Portland stone, which had been used in London a great deal since the time of James the First. The Chapel Royal in Whitehall was one of the first large buildings erected of that material, and Sir Christopher Wren used it for all his churches. The Monument on Fish-street-hill and Temple Bar were both constructed nominally of the same stone, and whilst the bas-relief representing the great fire of London was as perfect as possible, without a bad stone in it, it was well known in what a state of decay the west front of Temple Bar was, with exactly the same aspect. The different states of preservation of the two buildings were entirely owing to the different qualities of the same description of stone. At Somerset House, again, there was another remarkable instance of this. The river front was built by two different masons, under the same architect. One built the upper part and the other the lower. The part below the terrace was as black as could be, and was at the same time remarkably perfect, the upper portion was almost white, and there was scarcely a good stone it it; yet both portions of the building were of the same aspect, and the portion nearest the water was perfect, while that which was farthest from the water was very much decayed. It was after the bad stone had been used that chemists were set to work to try and find out something to stop the decay of our large public buildings, whereas the better plan would have been to have taken more care in the selection of the stone. He believed several thousand pounds had been expended upon the Houses of Parliament in trying processes to prevent decay, but up to this time he was not aware of any plan that was practically useful. A specimen was put into his hands some time ago to show how far the indurating material employed in one of these processes had penetrated into the stone, and he found that it had entered as far as three quarters of an inch, but that stone had been in the first instance put into a hot air chamber to drive out all the moisture, and afterwards immersed in the boiling fluid, and by that means this result had been produced; but he need hardly say that it was not possible to put the Houses of Parliament or Somerset-house either into a hot-air chamber or into a boiling fluid. Those appliances answered in the laboratory but not in practice. His own opinion was that any of the substances at present known applied to the preservation of stone would not be neutral in their effects,—they would either tend to preserve it or to hasten its decay. A great deal had been said in the paper as to the effect of water on stone; his own belief was, that if the stone was really good the water would have little or no effect upon it. By experiments he had made, he found that a cubic foot of Caen stone would absorb two gallons of water without showing more than a slight dampness on the surface. Hardly anything was more absorbent of water than a well-burnt grey stock brick, yet it was a very durable material. Mr. Smith referred to the church of St. Dunstan, in Fleet-street, as an example of exceedingly porous limestone exposed to the London atmosphere, and yet it had proved very durable. The decay of bad quality of stone was by no means restricted to London or other large cities, the atmosphere of which was impregnated with the acids, &c., to the effects of which the destruction of stone was attributed by scientific men. The town of Oxford presented a remarkable instance of this. He knew of no town in so deplorable a state in this respect, and he attributed it entirely to the injudicious selection of the quality of stone. The effects of varieties of temperature upon stone had not been sufficiently taken into account. The extreme differences in the temperature of winter and summer in this country might be stated at 100 degrees. That, in his opinion, had more effect in producing the decay of stone than anything else. Take the case of a building exposed to two different aspects, such as the Horse Guards, which was built throughout as nearly as possible with the same stone. The north and east sides of that building were blackened and in a perfect state, while the decay was principally observable upon the sides facing the south and the west, owing as he believed to the greater variations of temperature to which they were exposed. Dr. Voelcker had implied that limestones were unfit for outdoor carvings, and if so he should be glad to know what sort of stone was suitable, because they could only carve at great expense in sandstone, and, moreover, it was more or less laminated, and, in order to be durable, required to be put up in the position in which it was laid in the quarry, otherwise it became exfoliated.

Mr. G. F. Wilson, F.R.S., thought that Dr. Voelcker had treated this subject in a strictly practical manner. When a scientific chemist in the position of Dr. Voelcker explained what the particular form of decay in the stone was, showing that so large a proportion as 50 per cent. of sulphate of lime was present, it must direct the attention of practical men to the importance of using those particular kinds of stone which were not so liable to be acted upon by the sulphate of ammonia in the sooty atmosphere. The remarks of Mr. Smith, as to choosing the best portions of stone in a particular quarry, were very important. Dr. Voelcker attributed the decay of particular kinds of stone to the corroding effect of the black smoke of large towns forming an incrustation which reacted on the stone, somewhat in the same way as tartar acted upon the teeth, only with a different chemical reaction. That subject had been treated of several times in this room, and the different modes of getting rid of the smoke which occasioned the evil had been considered. A very simple method of preventing smoke in house fires was stated to be the having a grate with a false bottom and putting the coals in below, and removing them when in a glowing state from the bottom to the top of the grate.

Dr. Bachhoffner remarked that, judging from what had fallen from his friend Mr. Smith, every architect should be a Hugh Miller; but he thought very few architects could give that time to the study of geology which was requisite to bring them up to the practical standard suggested by Mr. Smith, as judges of the differeut qualities of stone. Hence the advantage of this Society and of the admirable paper brought before them this evening. He had not heard anything in the remarks of Dr. Voelcker as to the discarding of limestones, and he apprehended that their disuse for ornamental purposes was not suggested; but the novel point with him, and one which was of considerable importance, was the action of the sulphate of ammonia in the soot producing double decomposition, and thus contributing to the decay. He knew no reason why every household should not be made to consume its own smoke. Mr. Wilson had alluded to a plan which he (Dr. Bachhoffner) patented some years ago, but no one would take the trouble to employ it. It had been shown by Dr. Arnott and many others that the proper way of lighting a fire was from the top. Lighting from the bottom was a wasteful plan, for the heat distilled the coals at the top, and their heat-producing qualities were thus to a great extent lost. A fire lighted in the way he had just recommended would remain alight for four or five hours, and require no stirring. He thought Dr. Voelcker was quite right in saying that smoke was the cause of the destruction of stone in buildings, and he supposed they must submit to this till the legislature made it imperative that every house should consume its own smoke. The table in the paper showed them that whilst

the original composition of stone contained only one-tenth per cent. of sulphate of lime, in the decayed stone 51 parts out of 100 were converted into this salt.

Mr. F. A. ABEL remarked that there was no doubt the facts brought before them in this paper formed an important contribution to our knowledge as to the various causes which brought about the decay of stone. Mr. Smith had properly called attention to the importance of selecting proper descriptions of stone, of uniform quality, in future buildings, but it must be remembered that we had to deal with buildings already erected. With regard to the effects of moisture and of the different salts contained in soot, they were deserving of great consideration. Those who had given attention to the decay of stone would have noticed that where the stones remained moist, as they would in some parts of a building, there the decay was greatest. This was not alone owing to the disintegrating action of the moisture, but was due, in a great measure, to the absorption of the saline materials which constituted so large a proportion of the composition of soot. On one point he differed from Dr. Voelcker—that was as to the preservation of stone by artificial means. He had led them to believe that such a process as Mr. Ransome's would be successful. In that he (Mr. Abel) did not agree. In the composition used by that gentleman there were different salts, which, by chemical reaction, were intended to deposit an insoluble substance upon the surface and within the pores of the stone. Doubtless this insoluble substance, silicate of lime, was produced, but there was also produced a soluble substance, common salt, which soon dissolved away and left the pores of the stone open. The result was, the stone was not permanently protected; indeed, not more effectually than if some such substance as beeswax was applied, which for a time would fill up the pores of the stone, but would soon decay and require renewal. If they could discover a process (and he did not despair of this) by which they could get a preservative matter into the pores in a perfectly insoluble form, it would no doubt be valuable. To that end they were tending. He believed it was not impossible to deposit silica in a hard form in the pores of the stone without also depositing a soluble salt, and in this way they would effect what Dr. Voelcker had shown to be so desirable to prevent the decay of stone.

Mr. TRACY remarked upon the circumstance that, although there were evidences of the failure of portions of the stone in the front of Westminster Hall, the same description of stone had been used for the New Houses of Parliament. He would put in a plea on behalf of soot. In his opinion, the carbon which was deposited on the roofs of the houses in the form of soot, and afterwards washed away by rain, and conveyed into the sewers, acted, in a great degree, as a deodoriser of the sewage matters, and in that way was beneficial in a sanitary point of view.

Mr. BISHOP could state that what had been treated of as occurring to buildings in this country took place to a considerable extent in other parts of the world, under totally different climatic influences. The English church at Alexandria, although erected only six or seven years ago, in sandstone, already exhibited signs of decay in some parts, particularly in the ornamental portions. whilst the mosques in Cairo, which had been built hundreds of years, also of sandstone, were in the most perfect preservation, and the richly-ornamented domes of those buildings, exceeding anything we have in this country, remained perfectly sound. Damp had been spoken of as having a great effect upon some description of stones. In Alexandria, however, there was no rain whatever for eight months in the year, but there was a palpable dampness in the atmosphere of an evening. He had no doubt the stones took up a great portion of that dampness. On visiting the obelisk at Heliopolis, on the sides on which the current of wind set, there was an incrustation nearly half-an-inch thick, with slight vegetation upon it. That appearance was presented on only two sides of the obelisk, and there must be some considerable degree of moisture to fix that earthy matter. A similar appearance was presented by the stones all over Egypt; there was something deposited on them which would produce vegetation if there was sufficient moisture for that purpose. With regard to the destructive influences of frost upon stone, they were, no doubt, considerable, though in many places in the East, where there was no frost, the stone was nevertheless much decayed. The Coliseum at Rome, though built of a very porous stone, was in excellent preservation. The Cathedral of St. Peter was built of the same kind of stone, as were most of the buildings in Italy which were not of marble; it was very porous, though also very durable. The Cathedral of Cologne appeared to have suffered from the decay of the stone more than any similar building in this part of Europe, and many portions had to be entirely rebuilt. With regard to Caen stone, as far as his own knowledge went, it appeared that those stones which contained the greatest portion of silica were the best resistants of the influences of the weather.

The CHAIRMAN proposed that the thanks of the meeting be given to Dr. Voelcker for his paper. This paper was of a highly practical character, containing as it did a collection of chemical results obtained by experiment upon decayed stones taken from various buildings. It was true that no remedy had been suggested in the paper, but perhaps that was not the object, but rather that of eliciting discussion and information. This was the kind of paper most likely to bring out that information, either as to what stone should be avoided, or how to make the material employed more durable. Mr. Smith had given them another set of facts, those of his experience as to the differences between one bed of stone and another. He had also shown how, in the same building, different degrees of disintegration in the same description of stone had taken place. Taking the instance of Somerset House, he had stated that the lower parts and those nearest to the water had suffered less than the higher portions of the building. Then, with respect to the Horse Guards, Mr. Smith had told them that the northern and eastern portions were less decayed than the southern and western, and this he attributed to the greater change of temperature to which the latter were exposed, but it must be remembered that these were also exposed to the winds most prevalent in this country; therefore, the condition of the stone being originally the same, we must infer that the sides of the building exposed to the winds and rains nine months out of the twelve would be mechanically acted upon to a greater extent than the other parts, and there would also be a larger quantity of sulphur salts thrown upon those portions. Those causes combined, no doubt produced that difference which Mr. Smith had very truly stated. Here were the observations of a practical man pointing out where the decay took place, but he did not show them how the evil was to be avoided. Dr. Voelcker had shown them the chemical changes which took place in certain descriptions of stone, and in the case of the specimens of dilapidation exhibited this evening, it appeared that this destruction was going on while the restorations were in progress, so rapid was the decay in some instances. He begged to propose a cordial vote of thanks to Mr. Voelcker for his valuable paper.

The vote of thanks was then passed.

The Secretary called attention to a form of ventilator patented by Mr. Boyle, sent for the inspection of the members. It consists of circular apertures in some of the upper panes of a window, covered with wire gauze, and also openings at the lower portions of the room similarly covered, for the admission of fresh air. The inventor states that the effect of the gauze is to distribute the air, so as to avoid draught. Attention was also drawn to a clock case, in engraved metal work, after the style of monumental brasses, the engraved portions being filled in with lac of various colours, executed by Mr. Alfred Woodall.

The Secretary announced that on Wednesday evening

next, the 27th inst., a Paper by Mr. Samuel Brown, F.I.A., F.S.S., "On the Metric System of Weights and Measures, and its Proposed Adoption in this Country," would be read.

Proceedings of Institutions.

BANK OF ENGLAND LIBRARY AND LITERARY ASSOCIATION.—On Tuesday evening, the 12th of January, Thomson Hankey, Esq., M.P., delivered a lecture in the reading-room of the Institution. The chair was occupied by K. D. Hodgson, Esq., M.P., Governor of the Bank, who stated that the lecturer had taken a leading part in founding the society, and had shown great interest in its progress. Mr. Hankey chose for his subject "One Year of Government Expenditure; or, how the money comes in and goes out." He first dealt with the cash account of the Treasury from the 1st of April, 1862, to the 31st of March, 1863, specifying the amount expended by each department of the Government, and explaining how the various items were made out. The total ordinary expenditure for the year was £69,302,007 19s. 2d. He then went through the items of revenue in the same way, showing what the several departments produced, with the cost of collection. The ordinary income was £70,604,560 15s. 3d., being £1,302,552 16s. 1d. in excess of the expenditure. He pointed out, however, that in addition £1,050,000 had been expended on fortifications, reducing the excess of income over expenditure to £252,552 16s. 1d. Mr. Hankey concluded his lecture by paying a high tribute to the honour and integrity which in the present day characterised our public servants. At the conclusion of the lecture Mr. Matthew Marshall, President, in moving a vote of thanks to Mr. Hankey, reminded the members that thirteen years previously Mr. Hankey had opened that reading-room, and that his presence on this occasion was only another proof, if such were wanting, of the continued interest taken by him in the prosperity of the association. Mr. Hankey, in acknowledging the vote of thanks, assured the members of his continued interest in the prosperity of the society, and concluded by moving a vote of thanks to the Governor for his kindness in presiding. This was duly passed and acknowledged.

BROMPTON CHURCH OF ENGLAND YOUNG MEN'S SOCIETY.—The thirteenth annual report states that the debt originally incurred for the furniture and apparatus for the lecture room is steadily decreasing, and is now almost entirely discharged. The attendance at the public lectures, and at the Tuesday evening meetings, has not been so satisfactory as could be wished. The committee desire it to be known that these lectures are invariably a pecuniary loss to the society, and that an increased sale of tickets to non-members is necessary to justify the committee in incurring the expense of providing for future lectures. The literary class continues to afford to members an opportunity of improving themselves in elocution, composition, and in general information. The committee appeal to the friends of the society for donations of books or money to augment the library. The weekly exchange of periodicals at the members' homes continues to be appreciated. A reading room, supplied with newspapers, chess, and draughts, has been opened for members, at a payment of 1d. per week. The income has been £42 15s. 10d., and there is a small balance due to the treasurer.

LONDON MECHANICS' INSTITUTION.—On Wednesday, the 13th inst., a *soirée* was held at this Institute in commemoration of its 40th anniversary. The theatre and reading-room were decorated for the occasion; the walls were covered with pictures, and numerous objects of scientific and artistic interest were exhibited. The chair was taken by Mr. T. A. Reed, who, in opening the proceedings, delivered a short address, in which he referred to the establishment of the Institution, the first of its kind, in 1823, by Lord Brougham, Dr. Birkbeck, and others, and to the national benefits which had sprung from the many similar societies called into existence by its example. Addresses were then delivered by Mr. Joseph and Mr. Rees, members of the committee of management. The entertainments of the evening comprised singing and recitations, and the exhibition of dissolving views, &c. Dancing was kept up till a late hour. An announcement made during the evening, that the chairman had brought before the committee of management a proposal for supplying the members with refreshments at cost price, with the view of ultimately incorporating the club principle with the general working of the Institution, was greeted with applause.

SHROPSHIRE MECHANICS' AND LITERARY INSTITUTION.—The report for the year ending 31st December, 1863, speaks of its great and perhaps unprecedented prosperity. The income was £202 8s. 4½d., and there is a balance in the hands of the treasurer of £54 13s. 9½d. There has been a large increase also in the number of members, at present nearly 200, being twenty-five more than the total of last year. The committee express their obligations to various gentlemen who have contributed by lectures and otherwise to the success of the past year. Large audiences were attracted by the professional lecturers, Mr. Grossmith, Mr. Rowton, and Mrs. Inglis. For the last two years no classes have been in operation owing to the absence of any want having been expressed in this respect; but the committee reiterate their readiness at all times to assist in promoting classes in any of the useful arts or sciences, and to provide a comfortable class-room for this object.

SOUTHAMPTON ATHENÆUM.—The half-yearly meeting was held on Wednesday, January 13th, when there was a good attendance of members. The chair was occupied by Mr. W. Johnson, vice-president, who referred to the satisfactory manner in which the Athenæum had progressed during the past year, the subscriptions having increased from £34 in the previous year to £56 5s. 7d. in the last, and the entrance fees to lectures from 15s. to £15 6s., so that the committee had been enabled to clear off some of the liabilities; the total income for the year being £140 11s. 2d. The report, which was read by Mr. J. Locke, the corresponding secretary, stated that the various classes in connection with the institution now numbered ten, and were in active operation, under able and qualified masters. The lectures were highly successful, and, as well as the classes, had been the means of increasing the number of members. The reading-room was kept in a most efficient condition. An addition had been made to the library, the president (Mr. Steuart Macnaghten) having made his customary present of books, consisting of eighteen volumes; others were added, and a still further increase was recommended. In conclusion the committee reported an addition of 179 members since December, 1862, and that a good list of lectures had been made up for the next session. The balance-sheet showed that the balance in the treasurer's hands was £7 18s. 1d., and the liabilities had been reduced some £23. Steuart Macnaghten, Esq., was re-elected president. This society has been established since 1849. It offers to its members fortnightly lectures, a circulating library of 800 volumes, a reading-room supplied with the principal reviews, and daily, weekly, and monthly publications, also the privilege of attending several of the classes of the society, including elocution, reading, discussion and dramatic, all for the payment of one penny per week. There is also a coffee and club room, where chess, draughts, &c., are available for the payment of sixpence per quarter additional.

Manufactures.

REPORT ON THE IRISH FLAX CROP OF 1863.

BY WM. CHARLEY, J.P.

No doubt some of the readers of the *Journal of the Society of Arts* will recollect the series of papers I contri-

buted to its pages on the subject of flax. Those papers I afterwards collected and published in a small volume.* My object in doing so was to place within the reach of every one requiring such information, a *resumé* of everything known on the subject up to the present time, and to place the cause of flax cultivation before the public in a popular and accessible form. No doubt other parties have made most laudable efforts in the same direction, but their exertions have generally been confined to some special branch of the flaxen industry; and not one, that I am aware of, has endeavoured to grapple with the entire subject from the sowing of the seed to the completion of the finished fabric. This task I have endeavoured to accomplish, and though no doubt a difficult one, I hope and believe, with the valuable aid I received, when sought for, from many kind friends, that the result has been tolerably successful.

I am induced to make these remarks not in a vain or boastful spirit, but because the increased growth of flax, which I have so warmly advocated in the Society's *Journal*, is now an accomplished fact. This is no doubt partly to be ascribed to the continued attention paid to the subject by the public press, and other organs of opinion. The extremely low price of grain and the very unfavourable weather for harvesting for some years past, making the quality inferior, as well as the quantity, in comparison with ordinary years, induced many hitherto prejudiced farmers to try the much-talked-of flax crop in 1862, and a still larger number in 1863, the acres for those years being respectively 150,070 and 213,992.

The price of flax has kept up, and is at a very remunerative figure at present, while the yield and quality of fibre is decidedly beyond the average. My crop of 1863 produced £24 per statute acre, one-half of which I consider to be clear profit. A friend of mine, an amateur agriculturist, tried one field this last season for the first time, and off three acres, sold in Belfast market £65 value of produce. A still more interesting case is that of a respectable farmer residing close to my place, who told me the other day he had £106 off one field of $4\frac{3}{4}$ acres, the half of which he considerd clear profit, and without which he would have had some trouble in making up his rent.

These crops are all rather over the average, and are the produce of good warm soils in the Valley of the Lagan; but much of the flax is grown on cold, high-lying land, almost mountain land, and the result in such cases would not exceed perhaps half what I have mentioned.

Mr. Macadam, Secretary to the late Royal Flax Society, estimated the average produce per acre at 5 cwts., which at £3 per cwt. gives £15 per acre; and I think, making due allowance for the "high land" and other inferior crops, this calculation is very nearly correct. The value, therefore, of the Irish flax crop this year, would be £3,209,880. It is estimated that the entire flax-spinning power of Ireland is now about 650,000 spindles, equal to 65 large mills of 10,000 spindles each, each mill requiring in ordinary times 500 tons of flax fibre per annum; but as the present demand is chiefly for low, heavy qualities of yarn, one-fourth may be added this season, making say 625 tons, which, multiplied by 65, gives a total of 40,625 tons; the value, at £60 per ton, is £2,437,500. This leaves a surplus for sale to Scotch, English, and foreign spinners of £772,380, supposing only Irish flax to be used in Ireland; but as Irish spinners buy largely of foreign flax, we have a surplus of over one million value for export to Great Britain, where it is so much needed. This surplus exceeds the entire value of the Irish flax crop 15 or 16 years ago, and if the present demand remain steady, and linen fabrics continue to be used as substitutes for cotton, millions of money lately sent to the United States for raw material will be kept at home, and the wealth and prosperity of Ireland no doubt greatly increased.

This part of the United Kingdom possesses every capability for an almost unlimited cultivation of flax; even the almost useless bogs, if drained, would become further auxiliaries.

The importance of the crop to the Irish farmer is now recognised. In fact, it is admitted, that instead of the "wheat paying the rent" in 1863, so far as Ulster is concerned, it has in many cases been the flax. Wet seasons and low prices have acted severely against the cereal crops, but have not affected the value of the flax crop; while the scarcity and dearness of cotton itself, has so well sustained the prices of all articles used as cotton substitutes, that a more than average rate for flax has lately been obtained. The following tabular statement will show the acres of flax grown in Ireland for some time back:—

	English Acres.		English Acres.
1847	58,000	1856	106,311
1848	53,863	1857	97,721
1849	60,314	1858	91,646
1850	91,040	1859	136,282
1851	140,536	1860	128,595
1852	137,008	1861	147,866
1853	174,579	1862	150,070
1854	151,403	1863	213,992
1855	97,075		

"The total area under flax this year (1863) amounts to 213,992 acres, which exceeds by 39,413 acres the greatest extent sown in any year since these statistics commenced in 1847." (See *Abstract of Agricultural Statistics, Ireland, prepared by Mr. Donelly, Registrar-General.*)

My advice to all parties anxious to try the cultivation of flax is to inform themselves first as thoroughly as possible on the subject, and then "try their 'prentice hand," by beginning on a small scale for the first year. If half an acre be successfully grown at the first attempt, there is nothing to prevent due extension thenceforth, but it is unwise to increase largely till experience is first acquired. I think in England, the cultivation of flax might be greatly extended with benefit both to the farming and manufacturing classes.

In Ireland the increased growth during the past two years has been attended with the happiest consequences; and though I do not mean to say that flax cultivation is the only panacea for the so-called "distressed agriculturist," I do say that at least for some years to come there is every prospect of a high range of prices for flax fibre, and consequently of good profits to the farmer; while the fact that the flax crop does not suffer much from wet harvests, owing to its being pulled early in the season, is a further inducement to extend the cultivation, especially in those districts that have suffered so much of late from badly saved and deficient crops of grain.

Seymour-hill, near Belfast, Jan. 1, 1864.

* "Flax and its Products in Ireland." By Wm. Charley. Bell and Daldy, 186, Fleet-street, 1862.

DISEASE AMONG THE POTTERS.—The workers in the potteries suffer from diseases incident to their calling, and some portion of the unhealthiness no doubt arises from causes which, to a large extent, might be removed. The handle-makers and hollow-ware pressers injure their chests by pressure on their moulds; and the chests of the throwers, flat-pressers, and cup-makers, &c., are compressed, and the healthy action of their lungs is impeded by the peculiar posture, and intense pressure of their arms, in work. The manufactories built by past generations are insignificant, mean-looking, dirty monuments of the ignorance and poverty of the past, built in ignorance of all the laws of utility and of beauty. The area of the workshops around the stove-rooms is generally much too limited to be compatible with the health of the workman; the means of ventilation are, in many instances, not provided, and in others they are so unwisely fixed as to cause drafts, while the workmen, in their ignorant preference of warm air to the pure, frequently exclude the air altogether by closing the ventilators; they thus breathe an atmosphere which renders them extremely

susceptible of catarrh and all its consequences. The air is also laden with carbonic acid gas and vapour, and is thus partially poisoned by the decomposed matter of their own bodies, which ought to have the means of escape, to prevent its return to the lungs from which it was exhaled. This warm and impure air is also laden with dust. The dust from textile fabrics is not very inimical to health; but clay dust is infinitesimally fine, and, from its affinity to water, it readily combines with the watery element, whether in the form of liquid or vapour. It thus chokes up the minute pores of the skin, and clogs up the extremely delicate and fine air cells of the lungs, impeding their freedom of action. Unfortunately for the interests of health the dust is white. It is a clean looking dirt. Were it black, like that of the sweep, or coal-miner, or the worker in iron, the worker in clay, like other workmen, would daily wash the entire surface of his body. A complete and frequent ablution is necessary, for the fine white dust works its way through his clothes, and, combining with the insensible perspiration, it forms a layer of white dirt over a coating of natural scurf, and thus cakes him over with a thin layer of clay, which impedes the respiration of the skin. It is no marvel, therefore, that bronchitis, consumption, and asthma, above all, should afflict the workers in clay, and shorten their lives; nor is it any wonder that the paucity of hale old men should strike the attention of a stranger. The victims of the "potter's disease," as it is sometimes designated in the certificates for burial, go to their graves in units, and the fatal malady is insidious and slow, and but little notice is taken of it; but to the individuals, and to society as an aggregate, the result is the same as when a frightful accident comes upon the public with its multitude of victims. It is really a process of slow poisoning, and the public suffers with the sufferings of each individual victim. The evil arises partly from the foolish practice of sweeping the workroom in the morning. The dust is very dry, and cannot be swept except in a dry state. Motion causes it to float in the air, and its specific gravity is so light that it continues to float and to be inhaled as long as the worker continues to work. And yet the remedy is simple. Let each workshop be swept the last thing at night, rather than the first in the morning, and the injurious element will have many hours in which to settle, the stillness of the night air will be favourable to the process, and, in the morning, the lungs may receive their natural food more free from the impurities which engender asthmatical affections. But the sufferers are not blameless. Highly skilled as very many of them are in their artistic and beautiful work, they evince thoughtlessness and ignorance of the laws of health. If ventilators be provided, they keep them almost hermetically closed. If a window be fixed in the wall of the stove-room, it is allowed to be as dirty as though it had only a decennial cleaning, and to be broken, as if to admit the hot steaming air of the stove-room into the work-room. But their greatest mistake is in the irregularity of their working hours. The penalties cannot be commuted; they are always paid in full, for nature is inexorably just in her chastisements, as she is beneficent and prodigal in her gifts. But this is not the worst, for the misguided toilers feast themselves in their sloth, and then go on short commons in the days of prolonged and hard toil. No legislation can enforce the observance of every natural law, nor can any doctor of medicine cure a man's bad habits. Men may and must do those things for themselves which no others can do for them. Over-hours work is a deception to the manufacturer and an injury to his men. The most decisive testimony from several intelligent and experienced foremen shows that the average result of the over-hours system yields no more work than the ordinary hours of labour. If men do too much one day they cannot but do less on the next. Six or seven o'clock should terminate labours which begin at a proper morning hour. Were the manufactories to be regularly and absolutely closed at a given hour, a sufficient motive would exist to induce workmen to begin to work at an early hour of the day, and on the earliest day of the week; and thus regularity, health, and domestic comfort would be promoted, and the manufacturer would have greater reliance on his workpeople in the execution of his orders. The potters do not generally work more hours in the week than the operatives under the Factory Act, but the working hours per day are more unequally divided, and the workmen, those of a few manufactories excepted, do not, as under the Factory Act, cease work soon after noon on Saturdays, so as to have Saturday afternoons for marketing, garden labour, and open-air recreation. Many practical improvements may be, as many have been, introduced by the sound judgment and experience of masters and of workmen, apart from law; for it is the common interest of all to do what is just and wise; but that great ameliorations are still needed is clear, from the fact that few, even of the most moral and religious of the workers in clay survive the period of middle life, that potting is more injurious to health even than mining, and that in one instance the foreman of one of the largest and best regulated manufactories in the Potteries, in which his life had been spent, declares that though he himself is not sixty years of age, he has in his time seen almost the entire body of the workpeople there swept away two or three times by death, and that in all probability, had he not risen to his position in comparatively early life, he also would long since have shared the same doom. The early ages at which the children begin to toil, and adults begin to die, are to be almost equally deplored. The former are cutting papers, turning jiggers, and running moulds, when they ought to be conning their lessons at school, or enjoying boisterous merriment in the streets; and in the latter the incipient process of decay begins almost before they are men. Our potters, are, as a body, a pale-faced and comparatively young race of men; few live beyond the age of forty-five.

Commerce.

African Coffee.—Africa can produce coffee unsurpassed by any other in the world. Some samples from Western Africa have been pronounced equal to the finest Mocha. The tree is easy of cultivation, bears after four or five years, and requires but a moderate amount of care. In 1753, the first coffee tree in Brazil was planted in a garden at Rio. Little by little the coffee tree found its way to all the sugar plantations, small quantities only being grown for private use; but when St. Domingo was in revolution, at the close of last century, a coffee planter found his way thence to Brazil. He commenced cultivation for export. From that little coffee plant in the garden at Rio, one hundred years ago, nearly half the present consumption of the civilized world is now derived. Now, as coffee can be grown anywhere over thousands of miles in Africa, at a short distance from the coast, and as the civilized world could even now consume double the present supply of coffee, this useful berry may be looked to with hope and confidence as one of the instruments for African regeneration. Upwards of 100,000 trees have been set out during the last season, in lands on the St. Paul's River. It has been tried with great interest on the Gold Coast. Natal has become an exporter of it to a small extent. The cultivation of coffee will not interfere with that of any other staple. There seems little doubt that among the rich produce derived from the interior, coffee of the best quality will, in the course of a few years, figure in our markets in considerable quantities, with cotton and other absolute necessaries of our civilization and our manufacturing industry.

British Salt.—The export trade in this article to India, although restricted to Calcutta, has largely increased of late years. Within the last three years the shipments have doubled, and now average 180,000 tons.

If the monopolies which exist in China, Siam, the Dutch Indian possessions, and other eastern countries were abolished, a large field would be opened for the supply of British salt to the millions of population in the far East.

COTTON FROM THE GOLD COAST.—A small shipment, received lately by the Company of African Merchants at Liverpool, realised 2s. 1d. per lb. The Egyptian cotton seed, sent out to the Gold Coast last winter by the African Aid Society, has been planted with great success. The cotton produced from it is more abundant, and the quality better, than that grown from indigenous seed. France is fitting out expeditions for extensive cotton planting in her Senegal colonies.

Colonies.

CHINCHONA CULTIVATION IN JAMAICA.

The following is the report on this subject recently made to the Governor of Jamaica, by Mr. Nathaniel Wilson, the island botanist:—

The most important event in the history of the Botanic Garden of this island for many years past, has been the introduction, by seeds, of the quinine-yielding Chinchona. In the autumn of 1860, and by the month of October in the following year, I succeeded in rearing over 400 healthy plants, quite ready for planting out, but unfortunately the selection of a proper site for their final establishment was overlooked; and consequently the subsequent treatment the plants had to undergo proved destructive to one half their number. However, being wishful to prove, by every means in my power, the result of the experiment of testing the adaptability of the plants (constitutional and climatic) for cultivation in the higher altitudes of this island, finding the climate of Bath, as the summer approached, by far too warm, I had the whole of them removed in small pots to Cold Spring Coffee Plantation, St. Andrew's mountains, the elevation being about 4,000 feet, and placed under artificial treatment. I soon found the climate and soil of this locality to be all I could desire for the plants; and as it afforded every facility for carrying out so valuable an experiment, I at once availed myself of it, and planted out in the Coffee fields, on the 15th November, 1861, several plants of each species, then about two or two and a half inches in height. In 12 months after, a plant of the red bark (*Chinchona succirubra*) had attained to the height of 44 inches, with leaves measuring 13½ inches long by 8¾ inches broad. The same plant, now two years old, measures six feet in height, with 10 branches, having a circumference at base of stem of four and a half inches.

The *Chinchona nitida* and *Chin. micrantha* (grey barks) being of more slender habit of growth, have not made so rapid progress; the highest has attained five feet, with three branches; the leaves however are larger, and measure 14 by 10 inches. So far the experiment has thus proved eminently successful; indeed, it would be difficult to find more healthy trees in the neighbourhood; and in about three or four years hence they may produce seeds. In the meantime they can be largely increased by cuttings and layers in the hands of a skilful propagator.

During the first 12 months of the above-mentioned period, the collection remained in this locality under artificial treatment, in charge of a person who was quite unacquainted with their management, resulting in a serious loss of plants. During this period also, there were about 30 plants distributed to applicants, having a suitable climate for their development, but I have not been favoured with a statement of results, with the exception of those (15 in number) planted out in Cold Spring and Clifton Mount Coffee Plantations, all of which are doing well.

During the months of August and September, 1862, the collection was again returned to Bath; the plants were at this time eighteen or twenty months old, a critical period for forest trees in flower-pots, under unskilled treatment, and in a climate, too, which from its uncongeniality would have soon terminated their existence, had they not shortly afterwards (13th October) been planted out at Mount Essex, near Bath, at an altitude of 2,000 feet or little over. This site, as a temporary one, was had recourse to to save the plants alive until a better one could be obtained, and so far it has answered the purpose, and a majority of the plants are healthy, but have not made so fast progress as could have been desired. The soil is too loamy and adhesive to admit of a free and rapid escape of the heavy rains, which fall here in torrents during the greater part of the year. The altitude is by far too low for the Peruvian barks, and a few of the plants have died since they were planted. The red bark thrives best at an altitude of 3,000 feet, and, being a more hardy tree, the plants are more healthy, but as they are not yet too large for removal, I should recommend it being done during the cool months. A very important fact has now been established, viz., that the climate of our higher, and many of our intermediate mountains, is suitable for the growth of the most valuable species of quinine yielding plants, the *Chinchona succirubra*, and also a knowledge of the method of increasing the plants, and the soil best adapted for their full development has been obtained. Another most important discovery has lately been made in India, respecting the febrifugal virtues of the leaves of the red bark as they fall from the tree. An infusion of the leaves, in doses of one fluid ounce, was given to the first four cases of intermittent fever that occurred in the Civil Hospital of Darjeeling, and in every case the patient was cured without any other medicine whatever. The barks are found to yield as large a per centage of quinine in India as they do in their native forests.

The plants being lately established in many parts of the world, and success in growing them to perfection made known by practical experiment, cannot do otherwise than influence their cultivation immensely, conferring benefits of a domestic and commercial nature of no ordinary import. If it is intended to do justice to the plants from henceforth, the experiment has arrived at that stage which will admit of no further delay in removing them to a proper clime, and putting them under a system of management that will secure success in all practical operations connected with the plantation, so that the plants may rapidly be multiplied.

VICTORIA GOLDFIELDS.—The recent heavy rains have caused great inconvenience to the miners, and have much delayed the opening of new goldfields that are known to exist. The largest nugget recently found weighed 176 ounces.

AGRICULTURE IN VICTORIA.—The *Melbourne Argus* says:—Favoured by continued fine weather, our crops promise a gratifying abundance; feed is plentiful, sheep-shearing is well advanced, and the wool of this year will be found very superior in strength of staple and fulness of growth, whilst the total quantity of the clip will be large. The number of high-bred sheep in this colony increases greatly every year, and the flocks of many breeders are attaining a high repute. The improvement of the breed of sheep will be much forwarded by the result of the late Intercolonial Champion Show held here recently, when large prizes were adjudged to sheep reared in this colony, which now promises to take a high position in the competition with other Australian colonies.

TIME BALL AT ADELAIDE.—In imitation of the ball at the Royal Observatory at Greenwich, a similar arrangement has just been completed at Adelaide. The time ball was lowered for the first time on the 19th October.

BURRA BURRA MINE.—The quantity of copper ore raised in this mine during the last six months has been 4,438 tons, showing an increase of 233 tons on the previous six months. The cost of production was £44,349 2s. 8d., and the amount realised £51,936 6s. 6d., showing a profit of £7,587 3s. 10d.; total profits, inclu-

sive of other sources, £8,393 6s. 3d. The average produce of the 4,438 tons was 23 per cent. of pure copper.

The Melbourne Customs Returns are favourable, and show a considerable increase upon the same period of last year. The figures are as follow:—

Imports, January to November, 1862	...	£11,570,157
,, ,, ,, 1863	...	12,139,318
Increase...	...	569,161
Exports, January to November, 1862	...	£10,322,812
,, ,, ,, 1863	...	10,550,275
Increase...	...	227,463

Wine in South Australia.—The vintage promises very favourably this season, and a large quantity of wine will probably be made. It is desirable that arrangements be made for the storing of the wine here a sufficient time before it is shipped, instead of allowing it to be sent off in its crude state.

Victoria.—Transportation.—The Anti-Transportation League of Victoria have put forth a statement and appeal to the people of Great Britain, in which they protest against the report of the Royal Commissioners on Penal Discipline recommending transportation to Western Australia. They draw attention to the fact that Western Australia possesses several ports accessible to ships, at one of which, King George's Sound, the mail steamers and other vessels to and from the eastern colonies regularly call, and that the distance from Perth, the capital of Western Australia, and from King George's Sound, to Adelaide, the capital of South Australia, is 1,670 miles in the former case, and 1,220 miles in the latter, the usual length of passage from King George's Sound being four days. It therefore results that convicts do escape by sea from Western Australia, some of whom have been captured and dealt with in the eastern colonies. The population of Western Australia being 16,000, of whom but 11,500 are non-convict, and the whole population of the Colonies of Australia being about 1,317,000, expirees do, and will, as a general rule leave a country where their history is known; where employment is limited and wages are low; and where the field for enterprise and new occupation is confined within narrow limits and uncertain in its view, and pass to others where the population is large and the opportunities of gain considerable. After alleging other arguments against the proposed measure, the colonists conclude by saying that they use no language of menace, but rely on the justice of the people of this country. They declare that their well-grounded anxieties on this question cannot, and will not subside, unless transportation to any part of Australasia be abolished at once and for ever. The document is signed by Sir Francis Murphy, Speaker of the Legislative Assembly, Chairman of the Committee, and many others.

Obituary.

John Watkins Brett was born in Bristol, in the year 1805, and was the son of a tradesman of that city. He very early manifested a taste for the fine arts. This strong bias of his mind induced his parents to put him under the tuition of an artist of Bristol, of the name of Mintorn. Here he remained from about his twelfth to the close of his twenty-first year, studying as an artist. Some years before he was of age his services were much in request as a tutor in drawing and water-colour painting. In the year 1830 he took a house at Clifton, with the purpose of pursuing his profession. He more especially excelled, at this period, in miniature painting on ivory, but his taste and aims in art were universal. It was about this time that he paid a visit to some of the most celebrated galleries of the Continent, where he eagerly studied the celebrated works of the old masters, bringing back with him many memorial sketches of what he saw. There was at this time every promise of his taking a foremost place among the artists of his country; but this was destined not to be fulfilled, for on a night in the year 1831, a few days before the notorious Bristol riots, a fire took place, by which his own studies, accumulated for many years, and some rare works of art besides, perished in the flames. This formed a turning point in his life, and drew him from the practical pursuit of his profession to the study and collection of works of the old masters; and he shortly after left for the United States of America with a considerable quantity of fine paintings. There he remained for a few years, and soon after his return took up his abode in Hanover-square, where he resided for about twenty-eight years, devoting his attention to works of the old masters, and to works of art of every kind. When the electric telegraph was first started, his attention was powerfully attracted to the subject, and he seems early to have cultivated the idea of the possibility of extending it beyond the land, and making it an agent of almost instantaneous communication with all parts of the globe. In his work on the "Origin and Progress of the Oceanic Electric Telegraph," he says:—"My first idea of submarine telegraphs arose out of a conversation with my brother Jacob, early in 1845, when discussing the system of electric telegraphs as then recently established between London and Slough; and in considering the practicability of an entire underground communication, the question arose between us, 'If possible under ground, why not under water? and if under water, why not along the bed of the ocean?' The possibility of a submarine telegraph line then seized upon my mind, with a positive conviction, which led to the consideration of a plan for an entire new principle of subterranean and oceanic electric telegraphs. My brother being possessed of great natural mechanical talents, also at once occupied himself with the embryo model for a printing telegraph, to work by a single wire. Having completed our plans, my brother registered a company (June, 1845), for uniting America with Europe, by the very route since carried out, but at that time failed to obtain the attention of the public, it being considered too hazardous for their support. Having failed in July, 1845, in our offers to the English Government to unite Dublin Castle with Downing-street, I applied in 1846 to the French Government for a privilege to lay a submarine cable between Dover and Calais, which was accorded by Louis Philippe, and subsequently renewed by the Emperor of the French, and the present cable between Dover and Calais was laid on the 25th September, 1851, but an experimental line had been submerged the previous year, by which I passed the first electric message ever sent from one continent to another, which was printed by the instrument in Roman type. In 1847 I applied for a concession to the King of the Belgians, and, finally, in 1852, obtained this privilege, under which the second cable to the Continent was successfully laid on the 6th May, 1853, from Dover to Ostend. On the 19th July, 1852, the Act for the European and American Telegraph Railway was obtained at my cost, and I laid down, by virtue of this Act, the underground lines from Dover to London, Birmingham, Manchester, and Liverpool. The great objects I continually had in view were the submarine lines eastward to India and westward to America. In June, 1853, I obtained the concessions from the French and Sardinian Governments for the Mediterranean, as part of the Indian line. In January, 1855, I entered into an engagement with the New York, Newfoundland, and London Telegraph to establish the Atlantic line, and Mr. Cyrus W. Field having united with me to carry out this enterprise, the present Atlantic Company was formed in 1856 for that purpose." Mr. Brett was never married, and died on the 3rd December, 1863, at the age of 58. He was elected a member of the Society of Arts in 1861.

In the notice of the late James Tulloch, F.R.S., in the *Journal* of the 8th inst., an error inadvertently occurred. The Directors of the Guardian Assurance Company did not present the vases to him and his brother in 1856 but in 1821.

Publications Issued.

ILLUSTRATED BOOKS.

The art of illustration, as applied to poetical and other works, shows marked progress, and there appears to be increased appreciation of superior engravings or other means of illustration.

THE INGOLDSBY LEGENDS are made more attractive by the drawings of Cruikshank, Tenniel, and Leech. The illustrated edition of this work, published by *Richard Bentley*, is embellished with engravings by the three artists already named. The engravings, sixty in number, are produced by Dalziel; twenty-four are by Cruikshank, thirty by Tenniel, and six by Leech.

THE ENGLISH LAKES, MOUNTAINS, AND WATERFALLS, poems by Wordsworth, published by *A. W. Bennett*, is a work photographically illustrated by Mr. T. Ogle.

THE OLD ENGLISH BALLADS, published by *Ward and Lock*, is illustrated by Birket Foster, John Gilbert, Joseph Nash, Frederick Tayler, George Thomas, John Absolon, and John Franklin. Drawings of princely knights, of Robin Hood, of jolly abbots and merry kings, of fair ladies and joyous sports, are the worthy subjects of these artists.

THE PARABLES, illustrated by Millais, is engraved by the Brothers Dalziel. (*Routledge.*) Each parable is made the subject of an engraving. Cleverness of interpretation and execution, coupled with excellence of design, are among the merits of this book.

A CHRONICLE OF ENGLAND, between B.C. 55 and A.D. 1485, is written and illustrated by James E. Doyle. (*Longman.*) The designs, engraved and printed in colours by Edmund Evans, express with clearness the action of the various scenes described, whilst a careful consideration of costume and architecture is made evident.

THE LIFE AND ADVENTURES OF ROBINSON CRUSOE, illustrated by T. D. Watson, with 100 engravings by the Brothers Dalziel (*Routledge.*) This book excites curiosity from the fact of its having been so often illustrated before by others. Mr. Watson was the successful illustrator of an edition of "The Pilgrim's Progress."

Forthcoming Publications.

A LIFE OF WILLIAM MAKEPEACE THACKERAY, containing, it is said, much original and interesting matter relative to the early career of this great humourist, will shortly be published by *Mr. Hatton*, of Piccadilly. The author, Mr. T. T. Taylor, long resident in Paris, has been collecting information for many years, and will have much to say of Mr. Thackeray's artist life in that city. The book will be illustrated with some curious original sketches, and a portrait said to be original.

Notes.

THE ROYAL HORTICULTURAL SOCIETY has announced that it will hold an exhibition of ancient and modern bouquet-holders, to be opened on the 13th July, and to continue open for four weeks. For the three most artistic and effective modern bouquet-holders, made since July, 1861 (the opening of the Gardens), they will award three medals—one gold, one silver, and one bronze. The ornamentation of these bouquet-holders may be with precious stones or their imitations, enamelling of all kinds, niello work, or any other process. The competition is open to all nations.

SUBMARINE TELEGRAPHS.—A submarine cable has just been manufactured by Messrs. Siemens and Halske, at their cable works, Woolwich, for the French Government. The cable is for the purpose of connecting Carthagena, in Spain, with Oran, in Algeira, and is 115 nautical miles long. The conductor consists of a strand of three annealed copper wires of the best conductivity, each ·038 of an inch in diameter, and weighing together 72lbs. per nautical mile. The resistance of the strand is measured by 18·5 Siemens's mercury units, at a temperature of 20° C. The insulating covering consists of three alternate coatings of Chatterton's compound and the best gutta-percha, bringing the diameter of the core to ·26 of an inch. The weight of the insulating material is 144lbs. per nautical mile. The resistance of the insulating medium varies from 125 to 175 millions of Siemens's units at a temperature of 24° C. without pressure, and from 300 to 400 millions under a pressure equal to 1,400 fathoms of water. The outer covering is composed of two layers of the best hemp strings, dipped in a solution of sulphate of copper, and weighs 200lbs. per knot. It has been laid on under tension, and is encased in a flexible copper sheathing formed of four strips of phosphuretted best copper overlapping each other. The complete cable weighs 7½ cwts. per knot, and its breaking weight is 26 cwt. Its specific weight is 1·9, and its diameter ·046 of an inch, and its length is 137 knots, as shipped on board the French Government vessel on the 15th of December, and when tested there gave the following results:—Resistance of conductor, 18·2 Siemens's units per knot; of insulating medium, 1,300 units per knot at a temperature of 13° C. This cable is now being laid by the contractors, Messrs. Siemens and Halske.

Correspondence.

TRADE MARKS.—SIR,—Seeing that this subject is mentioned in this week's *Journal*, I beg to say that as far back as 1851 this question was supposed to have been settled. At a meeting held at the Crystal Palace permission was (as I understood) obtained to use the Exhibition seal, with the monogram or initial of each exhibitor at the bottom. This seal would have distinguished each exhibitor for ever; how it happened that this arrangement was not carried out I am unable to tell. Pads and stamps were to have been used similar to those of the Post-office, but it seemed a difficult task to get those articles properly made. Can any member give me information? I am, &c., HENRY NICHOLLS.

63, Jermyn-street, St. James's, Jan. 17, 1863.

SUBWAYS.—SIR,—It is not often that original inventors and projectors are so completely lost sight of when their projects or inventions happen, as in this case, to be fully carried out. Mr. John Williams, formerly a stationer and bookbinder in Cornhill, and the patentee of the flat-opening ledgers, was the original projector of "subways" under the streets of London. Some years previous to 1822 that gentleman had taken out a patent with that object, and in that year I afforded him some assistance in making out the plans and sections of his proposed subways, intended to be placed over the sewers, and to contain all the gas and water pipes in such a manner as that they should be always accessible throughout their whole length without it being necessary to tear up and relay the carriage way of the London streets. Mr. Williams spared no expense, and devoted himself to his project for a long series of years. He put himself in communication with every member of Parliament, and with every influential gentleman of the day. He called public meetings, at one of which the well-known De Berenger, of Stock Exchange notoriety, was present. The result was that his scheme was summarily put down by all classes, engineers included, and voted impracticable; but if carried out notwithstanding, that it would form a refuge for a lawless mob, that might break out some dark night, and reduce the whole of London to ashes. For the last forty years the metropolitan streets have, for one purpose

or another, been in a continual state of tearing up and laying down at an enormous expense to companies, commissioners, and the public at large, which would have covered the first cost of Mr. Williams's subways ten times over. In the years 1844-45 he was, to my knowledge, still actively engaged in fruitlessly following up his favourite project, but since that time, when he lived at Blackheath, I have entirely lost sight of him, and suppose that he must be dead. The subway now completed in the new street over the water is due to Mr. Williams, and not to the Thames Tunnel, constructed by the late eminent civil engineer, Sir Isambard Brunel.—I am, &c., Henry W. Reveley.

Reading.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...R. Geographical, 8½. 1. *a.* "Mr. Hector's Exploring Expedition in Middle Island, New Zealand;" *b.* "Report of Mr. McKerrow on the Lake District of Otago." 2. "Lefroy's Expedition in Western Australia," communicated by the Colonial Office. 3. Professor H. Y. Hind, "Ascent of the Moisie River, Labrador."
Entomological, 7. Annual Meeting.
Actuaries, 7.
Medical, 8½. Mr. Walter J. Coulson, "On Lithotrity."

Tues. ...Med. and Chirurgical, 8½. 1. Dr. Habershon, "On the Effects of Implication of the Pneumogastric Nerve in Aneurismal Tumours" (conclusion). 2. Dr. John Harley, "On the Endemic Hæmaturia of the Cape of Good Hope." 3. Mr. Callender's Account of Amputations, at St. Bartholomew's Hospital, 1853-63."
Royal Inst., 3. Prof. Tyndall, "On Experimental Optics."
Civil Engineers, 8. Mr. J. B. Redman, "The East Coast, between the Thames and the Wash Estuaries."
Zoological, 9.
Ethnological, 8. 1. Mr. Alfred R. Wallace, "On the Ethnology of the Indian Archipelago." 2. Mr. S. Casie Chitty Maniegar, "An Account of the Mookwas, in the District of Putlam, in Ceylon."

Wed. ...Society of Arts, 8. Mr. Samuel Brown, "On the Metric System of Weights and Measures, and its Proposed Adoption in this Country."
Archæological Assoc., 8½. 1. Mr. Planché, "On a Stone Coffin and Cross, discovered at Ash." 2. Mr. Vere Irving, "On the Discovery of Roman Remains at Carlisle."

Thur. ...Royal, 8½.
Antiquaries, 8.
Philosophical Club, 6.
Artists and Amateurs, 8.
Royal Inst., 3. Prof. Tyndall, "On Experimental Optics."

Fri. ......Royal Inst., 8. Prof. Frankland, "On the Glacial Epoch."

Sat. ...Royal Inst., 3. Mr. J. Lubbock, "On the Antiquity of Man."

Patents.

From Commissioners of Patents Journal, January 15th.

Grants of Provisional Protection.

Aerial locomotion—3284—H. R. de Saint Martin.
Aniline colours—3302—G. Phillips.
Artificial manure—3264—J. Maynes.
Atmospheric railways—35—W. Malins.
Brushes—45—E. G. Camp.
Coffer dams—47—C. J. Appleby and J. Vavasseur.
Cotton gins—3286—H. Bayley.
Cotton spinning—39—R. A. Brooman.
Fabrics, ornamental—3305—R. Bell.
Felted fabrics—29—J. H. Whitehead.
Furniture padding, rendering obnoxious to vermin—3097—J. Tod.
Heating apparatus—3294—J. M. Vanderfeesten.
Holdfasts for securing the ends of bands—3244—R. E. V. Hees.
Hydro-carbons, &c.—3296—T. B. Cochrane.
Igniting explosive projectiles—3258—A. Noble.
Kilns for drying bricks, &c.—3266—J. Duckett.
Kneading machine—3262—W. E. Gedge.
Knives for rag cutting engines—3238—W. E. Gedge.
Lathes—3254—S. B. Ardrey, S. Beckett, and W. Smith.
Lifts for raising or lowering weights—3240—J. Gjers.
Locomotive engines—3260—W. Marsden and F. H. Stubbs.
Looms—9—J. and R. Blakey.
Lubricating composition—3290—H. Caunter.
Metallic surfaces, uniting—27—W. B. Barnard.
Oakum, &c., converting rope into—3246—J. Ronald.
Paper cop tubes—13—W. Ambler.
Percussion fuzes—3250—W. Clark.
Pistons, packing—3148—P. Ward.
Potash, caustic—3232—J. Shanks.
Projectiles for ordnance—3268—J. D. Bryant.
Projectiles—3270—D. S. Price.
Pumps—3288—J. Price.
Purses, &c.—3280—W. Clark.
Railway bridges—3085—R. Thornton.
Railways, permanent way of—3276—J. E. Billups.
Reaping and mowing machines—3054—R. Hornsby, jun., and J. E. Phillips.
Saccharine substances, centrifugal machines for treating—2342—P. A. L. de Fontainemoreau.
Sewing machines—3292—J. Cumming.
Sewing machines—11—H. A. Bonneville.
Shields or tips for boots and shoes—3242—J. H. Johnson.
Shields or tips for boots and shoes—3256—J. H. Johnson.
Ships' masts—43—J. B. Elwell.
Ships of war—3281—T. Tozer.
Sizing yarns—19—J. Bullough.
Sizing yarns—3225—J. Eastwood.
Slide valves—3279—W. Clark.
Steam boilers, feeding—3236—R. A. Brooman.
Steam boilers—3274—T. Hall.
Steam boilers, removing the scum from the interior—3248—J. Knowles.
Stoves, &c., decorating—3278—W. Wilson.
Teasling machine—3298—W. E. Gedge.
Telegraphic cables—3252—F. Walton.
Theatrical purposes, exhibiting the flow of real water for—3272—E. T. Smith.
Toys—3300—A. C. J. Lengelée, F. P. Morel, and D. G. M. Coquet.
Turnip cutter—3234—J. Sainty.
Watches, securing—15—F. Andoe.
Water gauges—49—J. Bond.
Windlasses—3282—J. B. Cronin.
Wool carding—37—E. Fairburn.

Invention with Complete Specification Filed.

Knitting machinery—34—G. T. Bousfield.

Patents Sealed.

1809. F. A. Calvert.	1821. C. H. Roeckner.
1810. R. B. Brassey and J. Hargreaves.	1827. G. Haseltine.
1812. J. B. and W. H. Bailey.	1831. W. E. Newton.
1813. A. Smith.	1843. M. A. Soul.
1816. F. Ayckbourn.	2056. C. G. Wilson.
	2648. J. Marshall.

From Commissioners of Patents Journal, January 19th.

Patents Sealed.

1823. W. L. Aberdein.	1909. E. Sutton.
1824. C. S. Duncan.	1910. T. Fellowes & H. Hemfrey.
1829. G. Alcan.	1913. J. W. P. Field.
1830. W. Naylor.	1924. E. A. Cotelle.
1834. C. Senior.	1942. W. Clark.
1840. W. Cole.	1951. A. V. Newton.
1845. W. and J. Garforth.	1984. W. Gray.
1852. A. English.	2033. E. H. Bentall.
1857. P. E. Gay.	2045. J. Arthur.
1858. J. Boyd.	2126. E. Amourous.
1859. F. Tolhausen.	2201. A. V. Newton.
1863. F. and L. Ford.	2287. P. McLaurin.
1864. T. Thorne.	2331. T. B. Daft.
1865. G. Haseltine.	2745. S. Smith.
1874. J. Jewell.	2859. J. Southgate.
1889. G. Smith, jun.	2958. W. E. Newton.

Patents on which the Stamp Duty of £50 has been Paid.

121. E. Stevens.	130. W. Spence.
87. M. A. Muir & J. McIlwham.	163. R. Mushet.
122. H. Sagar.	129. R. W. Swinburne.
104. J. Horsey.	169. G. White.
125. J. Reading.	124. E. Whittaker and J. Clare.

Patents on which the Stamp Duty of £100 has been Paid.

157. E. Clark.	185. H. Cater.
159. E. Clark.	291. W. E. Newton.
130. M. A. Muir & J. McIlwham.	258. G. E. Dering.
148. R. and J. Reeves.	153. T. Sagar and C. Turner.

Registered Designs.

Spring holder for gas and lamp glasses and shades—4612—Jan. 5—D. Hulett, High Holborn.
Continuous stave board for pails, tubs, and vats—4613—Jan. 7—J. B. Palmer, Upper Thames-street.
A water syringe end—4614—Jan. 18—Thos. Hickin, Birmingham.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, JANUARY 29, 1864. [No. 584. Vol. XII.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at 8 o'clock.

Feb. 3.—"On Instantaneous Engraving upon Metal." By Mons. E. Vial (illustrated with experiments).

Feb. 10.—"On Fresco Painting, as a suitable mode of Mural Decoration." By J. Beavington Atkinson, Esq.

Feb. 17.—"On Public and Private Dietaries," a sequel to the paper read on the 16th December last. By Dr. Edward Smith, F.R.S.

Cantor Lectures.

Courses of Lectures on the following subjects will be delivered during the Session:—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. Hastings, Esq., Barrister-at-Law.

Fine Arts Applied to Industry. By W. Burges, Esq.

Chemistry Applied to the Arts. By Dr. F. Crace Calvert, F.R.S.

The fourth lecture of Mr. Hastings' course will be delivered on Monday, 1st February, at 8 o'clock; the subject will be as follows:—

The Foreign Enlistment Act; its Operation on Commerce.

The following is a syllabus of Mr. Burges's Lectures:—

Feb. 8.—Lecture I. Introductory:—What is an art manufacture? Advancing state of English manufactures in an art point of view. Much owing to Government Schools of Art. Impediments to further progress:—1. Want of a distinctive architecture in the 19th century fatal to art generally. 2. Want of a good costume fatal to colour. 3. Want of sufficient teaching of the figure fatal to art in detail.—Hints for the advancement of Art applied to Industry.—Design of following lectures:—1. To take one or two phases of some particular industry in past times. 2. To compare them with our own phase of the same industry. 3. To offer suggestions for our future improvement.

Feb. 15.—Lecture II.—*Glass.*—Antique glass, Venetian glass, modern glass (Powell, Chance, &c.); Mediæval stained glass; modern ditto; Mediæval enamels; modern ditto; (Legoste of Paris.)

Feb. 22.—Lecture III.—*Pottery.*—Etruscan vases (Wedgwood); Italian majolica (Minton); Sèvres china; modern biscuit.

Feb. 29.—Lecture IV.—*Iron and Brass.*—Antique bronzes; Mediæval ditto; modern French bronzes (Barbédienne); Mediæval dinanderie; modern ditto (Hardman, Hart, &c.); Mediæval and Renaissance wrought iron; modern ditto; cast iron.

Mar. 7.—Lecture V.—*Gold and Silver.*—Antique and Mediæval plate; modern ditto (Elkington); Antique and Mediæval jewellery; modern ditto; Antique and Mediæval coinage; modern ditto.

Mar. 14.—Lecture VI.—*Furniture.*—Mediæval furniture, oak and painted; Renaissance; 16th and 17th centuries; modern.

Mar. 21.—Lecture VII.—The Weaver's art; Mediæval, Eastern, modern.

The Lectures will begin on each evening at 8 o'clock.

Institutions.

The following Institution has been taken into Union since the last announcement:—

Crewe Mechanics' Institution.

The Christmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

Cantor Lectures.

The Operation of the Present Laws of Naval Warfare in International Commerce. By G. W. Hastings, Esq.

The third lecture of this course was delivered on Monday evening, the 25th inst. A *résumé* will be given in the next number of the *Journal.*

Sixth Ordinary Meeting.

Wednesday, January 27th, 1864; James Heywood, Esq., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Dutton, Robert, Cambridge-lodge, South Fields, Wandsworth, S.W.
Goodliffe, Fred. Gimber, Cecil-house, Cheshunt, Herts.
Goodyear, George Edward, Club Chambers, 15, Regent-street, S.W.
Kidd, John, 7, Wine Office-court, Fleet-street, E.C.
Offer, George, jun., 115, Leadenhall-street, E.C.
Walmsley, Henry Benjamin, The Elms, Acton, W.

The following candidates were balloted for and duly elected members of the Society:—

Adams, Thomas, 5, Alfred-terrace, Spa-road, Bermondsey, S.E.
Burn, Charles, 3, Middle Scotland-yard, Whitehall, S.W.
Byron, Thomas, Wolverhampton.
Dart, Richard, 12, Bedford-street, Covent-garden, W.C.
Flower, Charles Edward, Stratford-on-Avon.

Harcourt, Colonel Francis Vernon, 5, Carlton-gardens, S.W., and Buxted-park, Uckfield.
Moon, William, F.R.G.S., 104, Queen's-road, Brighton.
Rood, John Yeoman, Compton-street, Soho, W.
Simons, William, London Works, Renfrew, N.B.
Soul, Matthew Augustus, 3, Leadenhall-street, E.C.
Spode, J., Hawkesyard-park, near Rugeley.
Tasker, William, Halifax.
Wilson, Robert H. C., 12, Wilson-st., Gray's-inn-rd., W.C.

And as Honorary Corresponding Member,
Coomàra-Swamy, Mutu, Mudeliàr, Ceylon.

The Paper read was—

ON THE METRIC SYSTEM OF WEIGHTS AND MEASURES, AND ITS PROPOSED ADOPTION IN THIS COUNTRY.

By Samuel Brown, F.S.S., Vice-President of the Institution of Actuaries.

The great advantages, social, commercial, and political, which would attend the use of one system of weights, measures, and coins throughout the world, have generally been admitted, but as generally considered impossible. Such a result is frequently deemed to be merely the dream of a visionary, or the speculation of a philosopher, who has no practical knowledge of the world, and is incapable of appreciating the difficulties which stand in the way of accomplishing so desirable an object. It must be granted that the difficulties are great. There are prejudices to be overcome, ignorance to be enlightened, national pride to be vanquished, and, in many cases, trade customs, the growth of ages, to be abolished, before one nation can combine with another, much less several nations agree together to adopt a common system. Yet, in spite of all these obstacles, the present century has witnessed such great changes in the old practice, and all tending towards a uniform standard, that I propose to give a brief sketch of the present position of this question, and to show what has been done and is doing to carry on a work so important to the social condition of any country, and to the free interchange of its produce or manufacture with other countries.

It would occupy too much space and time to go far back to show the various systems which have been used, and the causes of the changes proposed or carried out. It will suffice for my present purpose to date only from the period of the Great Exhibition of 1851, to state what changes had then been effected, and what progress has since been made towards the realisation of this "dream" of a universal system. For that Great Exhibition, in itself and as the parent of others, so fruitful in results beneficial to the whole world, we can never be sufficiently grateful to the illustrious Prince Consort, to whose persevering energy and far-seeing intellect its success was mainly due, whose labours in the cause of social science have been the more appreciated, as his quiet and unobstrusive influence had been silently and imperceptibly turning the attention of the nation to the defects in our social system, and to the state of isolation in which in many respects we stood in regard to foreign nations.

The Great Exhibition naturally forced upon the public mind the question now under consideration. It was impossible to compare together the produce of the world's industry till the measures, weights, or values were reduced to a common system. Simple as it may seem, this was impossible at the time, because there was no system recognised by this country which would be admitted by others as a common standard. The consequence was, that some of the greatest advantages proposed by the Exhibition were lost; manufacturers particularly versed in one branch of trade might, by their special knowledge and with many laborious calculations, compare their own articles as to relative cost and value with those of other countries, and take hints for their improvement; but the general public could only entertain a sort of confused and indefinite admiration. Values and quantities were reckoned by all sorts of different standards, and true estimation and measurement were out of the question. The task of translating foreign monies and reducing foreign weights and measures to our own was, however, an essential part of the duties of the jurors, and, at the close of the Exhibition, the Society of Arts, which had been so mainly instrumental in carrying into effect the great idea, presented a memorial to the Lords Commissioners of Her Majesty's Treasury, pointing out the advantages of a decimal system of computation. They urged the great importance of uniformity in measures, weights, and coins in different countries, as increasing international commerce and facilitating scientific research, and, with great justice, argued that if any change were to be made it would be desirable at once to adopt that which would bring us into direct communication with foreign nations, thus obviating the inconveniences of a second change. They alluded to the metric system of weights and measures, which had already been adopted by several of the nations of Europe. Complete sets of the measures, weights, and coins of this system were sent by the Government of France to the Great Exhibition, one of which was purchased by Mr. Henry Johnson, and presented to this Society, in whose museum it still remains.

Up to this time the metric system was but little heard of or understood in this country, but having been thus and with such authority introduced to the notice of the public, it may be well to consider what claims it has upon our attention above other systems, and what was the cause of its popularity amongst a body of men who could have no motive in recommending it but the progress of social improvement and the real interests of the public.

What then is the metric system of weights and measures, and how came it to be first introduced?

Long previous to the French Revolution the confused state of the ancient weights and measures in France had attracted attention, and efforts were made to reform them. But it was not till 1790, when the Constituent Assembly passed a resolution desiring the king to obtain the co-operation of the English Legislature for the determination of a natural unit for weights and measures, that the question began to be vigorously taken up. It was at first proposed that an equal number of Commissioners from the Academy of Sciences and our Royal Society should meet and ascertain, at some suitable parallel of latitude, the length of the seconds pendulum; but this proposition was not agreed to, and the French Academy proceeded by themselves. They decided that all the multiples and subdivisions should be decimal; and that the units of surface, capacity, and weight should all depend on the unit of length. Commissioners were appointed, comprising the names of the eminent mathematicians Lagrange, Laplace, Borda, Monge, and Condorcet, to discuss the whole question. To get rid of the objections of national prejudice, they eventually decided to take a unit deduced from the dimensions of the earth, as being of universal application. They fixed that the unit of the whole system should be the ten-millionth part of the arc of the meridian between the equator and the North Pole; and in order that no doubt of its accuracy should be entertained, a new measurement of the earth was undertaken, to be conducted by the astronomers Delambre and Mechain. These geodesical operations were carried on for a period of ten years, and the personal adventures of the savants and their assistants, amidst the passions and prejudices of a sanguinary revolution, and in countries desolated by war, would make a volume of exciting interest. The arc to be measured extended from Barcelona to Dunkirk, and was afterwards prolonged to Fromentera, one of the Balearic Isles, near the coast of Spain. When the measurement was completed, delegates were invited from all the nations of Europe, including Great Britain, to assist in the reduction of the calculations, and decide on the several units of capacity and weight. The rivalries of war, unhappily, prevented this country from joining in this work of peace,

but representatives from the Netherlands, Sardinia, Denmark, Spain, Switzerland, and several states of Italy attended. The charge frequently made against the metric system, that it is merely national and peculiar to the French, is thus completely refuted. Though originating in France, and perhaps facilitated by the overthrow of ancient usages and local prejudices, it was proposed to the whole world, in the interests of commerce and science in general, and all nations were invited to discuss and agree to a common system.

The result of these deliberations was the fixing definitely the exact length of the metre. The square of ten metres, or 100 square metres, was made the standard of surface measurement, and called the "are." The cube of a tenth part of the metre, or cubic decimetre, was the standard measure for liquids, called the "litre." The weight of a cubic centimetre of distilled water at its maximum density was the standard for weight, and called a "gramme." We may leave out the "stere," used as the unit for solidity, which was a cubic metre, as not being required for international purposes. It was used in France for measuring the solid contents of stacks of firewood.

Such being the units, all derived from the "metre," the next step was to simplify the nomenclature of the multiples and subdivisions. This was done by prefixes, which are not French, but derived from the dead languages, taught in the schools of all countries, all the multiples being denoted by Greek, and the subdivisions by Latin prefixes.

	Greek.			
Thus,	Deca...	... was used for	10	times.
	Hecto	... ,,	100	,,
	Kilo ...	... ,,	1000	,,
	Myrio	... ,,	10000	,,

For the subdivisions the prefixes were :—

Latin.	
Deci........................	for $\frac{1}{10}$th part.
Centi	$\frac{1}{100}$th part.
Milli	$\frac{1}{1000}$th part.

These being prefixed to the respective names for each unit of length, surface, capacity, and weight, the whole system was complete. In acquiring it the memory is taxed in the smallest possible degree, and it is, as a system of weights and measures, in all respects a marvel of simplicity and perfection. If this could be brought into universal use, all the complicated and numerous tables taught in the schools of different countries might be swept away, and the following brief table, common to all nations, be substituted in their place :—

	Length.	Surface.	Capacity.	Weight.
Myria ...	10000	...	...	10000
Kilo	1000	...	1000	1000
Hecto... ...	100	100	100	100
Deca	10	...	10	10
Units.	Metre.	Are.	Litre.	Gramme.
Deci	·1	...	·1	·1
Centi... ...	·01	·01	·01	·01
Milli	·001	...	...	·001

Whatever objections may be made to the use of the learned languages for names which are to be learnt and most extensively used by the poor and the ignorant, there can be no doubt that they give the greatest facility in acquiring the system. In any country in which this system is introduced, even if the old names of the nearest corresponding weights and measures should in popular use be applied to the new, it is very desirable that, in public and private schools, the original nomenclature should be taught, as the means of firmly fixing in the memory, with the least expenditure of time and labour, the entire system.

The advantages which this system possesses over others are almost visible on the mere inspection of the above table.

1. Its extreme simplicity. The learner has only to make himself acquainted with the dependence of the three units upon the metre, the basis of them all, and the prefixes, decimally increasing or decreasing values. There is nothing more to learn. By this simple process we get rid of the necessity of committing to memory all the cumbrous tables of weights and measures, which harass the minds of youth, take up so much of the valuable time of early life, and yet practically leave little behind that is useful thereafter. From an inquiry made amongst schools, by Mr. James Yates and Professor Leone Levi, it was ascertained that for a boy to learn our present system of weights and measures, with all the branches of arithmetic thereon depending, would occupy nearly three years, whereas the probable time for a decimal system would be less than ten months.

2. Its decimal character. However ingenious may be some of the schemes propounded, and whatever advantages the duodecimal system may possess by the greater number of divisors, there is a growing feeling amongst all practical and commercial men, and in all countries, in favour of decimalizing the weights, measures, and coins. The power of rapid calculation, and the vast saving of time and labour, the use of tables of logarithms, which, if all fractions were decimal, could be readily applied to commercial computations, are a set-off against the greater facility of division by the present scale. In decimal fractions there is no difficulty in taking the $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$th, &c. It is in division by 3 and its multiples that the recurring decimals principally arise, but in business transactions these could always be taken to any desired approximation. All actuaries are in the habit of making their money calculations by decimals of a pound sterling, in which this difficulty is constantly met. But the difference of taking the next higher or lower figure is too small to be appreciated. The advantages of the decimal character of the metric system are admitted by many whose objections are only against the use of an international system as causing more changes than are necessary in the interior trade of this country.

3. I think, however, we may be prepared to admit that, considering the vast increase in our foreign trade, and the constant removal of restrictions on freedom of commerce, some sacrifices may justly be made of national prejudices, and even temporary inconvenience endured, to obtain a system of weights and measures in common with a large part of Europe and America. One of the greatest recommendations of the metric system is that it is a final one, and that it is international. All other changes, however great improvements they may be on existing systems in any country, leave something to be desired, unless they also tend to bring nations together and facilitate their intercourse. Any country adopting the metric system finds itself at once in direct relation with several important countries which have already taken the final step, and the united population of which cannot amount to less than 120 millions.

If the plan were not even so perfect as it is, it would be expedient and wise to adopt a system common to so many, rather than remain isolated and obstructive in a matter in which the interests of commerce are so much concerned.

It will be well to take a glance at the progress which the metric system has already made in the countries in which it has been wholly or partially adopted.

France.—The circumstances under which the metric system was introduced into this country, naturally prolonged the period of its trial before it could be made compulsory. The Board of Works adopted it from the beginning. The officers and shipbuilders in the naval arsenals used it by the permission or rather by the authority of the Government. But for a long period it was permitted to the people to continue their old system, and we know how difficult it is to eradicate ancient prejudices and to make popular even real improvements until a new generation has learnt and practised them. Napoleon, for many reasons, allowed the usages of the old monarchies, and did not press on the people what had

been introduced during a revolutionary period. The restored Bourbons also could not be expected to look with much favour on a system devised and introduced under the Republic. Thus the old system continued to be legal long after the new one had become known, and some confusion was the result. But under Louis Philippe, a law was passed, in 1837, providing for the full establishment of the metric system in 1840, and since then it has rapidly grown in favour, though the people still give, in some cases, the old names to the nearly equivalent values in the new system.

Belgium.—The French originally introduced the metric system into this country when they got possession of the Austrian Netherlands. The French nomenclature was changed when Belgium became united with the Dutch Netherlands, but again restored by a law passed June 18, 1836, after she recovered her independence in 1830. But it was at a later period, by a law dated October 1, 1855, that the verification and the form and series of weights and measures were definitively regulated. The series, both for weights and measures of capacity, was then represented by the figures 50, 20, 10, 5, 2, and 1, and the same with regard to money, so as to obviate the objection that the series was not sufficiently subdivided for the ordinary purposes of business. A law of July 9, 1858, further enforced the use of the unit of the metric weight, the gram in prescriptions and sales in chemists' shops. Although in some operations of business, as in the sale of stuffs, the ell is used, and although in the country peasants still keep in some places to the ancient measures of land, yet amongst the population generally the metric system is fully introduced. Not only is it exclusively employed in public documents, in the markets, in commercial operations, and in manufactures, but in every register and commercial writing, whether for wholesale or retail business, the francs and centimes and the metric weights and measures are exclusively employed. I owe this recent information of its progress in Belgium to M. Visschers, the distinguished social reformer, who gave evidence when in London before Mr. Ewart's Committee.

Holland.—In 1816 the metric system was introduced, and became law in 1819. But the former Dutch names were used for the nearest corresponding weights and measures, with the addition of the word "new," to distinguish them from the old. It is enforced in all commercial dealings, except in weighing medicines, in which we should have thought (as is admitted by the chemists of this country) its precision and minute subdivisions would have given it peculiar claims to be recognised.

Switzerland.—In this country a double system prevails, the German and French elements causing some opposition. Proportionate parts of the meter are used for the measures of length, the foot being 0·3 meter and decimally subdivided, and the unit of road measure being 4,800 metres. The unit of weight, also, is the half-kilogram, or 500 grams, but not decimally divided. No doubt the further improvement of the system here awaits the changes which Germany yet has to make.

Spain.—By a law of the 19th July, 1860, the metric system was to come into force on 1st January, 1859, although for part of the kingdom it commenced in 1853. The system was also extended to Spanish America and Cuba. Even so far back as 3rd January, 1851, the meter was ordered to be used in all announcements of sales of the national property. Count de Ripalda, who has taken an active part in the different statistical congresses in London and abroad, states that the Government are sincerely anxious for its full enforcement. The engineers, the artillery, the military and marine departments, have adopted it. The sales of houses and lands, and the public domains are made by hectares and square meters. The government has purchased 600 collections of standards, and is about to purchase more, that every large town may have the means of verifying the weights and measures in use. On the railroads the goods traffic is charged by kilometers and kilograms. Ships are about to be measured by the metric ton. Tables of the old measures, with the reduction into those of the metric system, from 1 to 1,000, have been published by authority. To this it may be added that within a few months an advertisement appeared in an English journal, from the Spanish Government, for tenders for the manufacture of no less than 80,000 pieces in the metric weights and measures, for the supply of the interior and of the colonies. These proposals, it is thought, will be accepted by the French manufacturers.

Portugal.—The metric system was established by law in 1862, and a special department formed for carrying it into force. At the International Statistical Congress, held in Berlin last autumn, the Marquis d'Avila, the delegate from Portugal, gave an account of its progress in that country. By a decree of 14th December, 1852, the metric system was declared compulsory, ten years afterwards, throughout the whole kingdom. The Government had power to fix the successive periods at which the various parts of the system should come into force, which was not till six months after the respective standards had been distributed, and the necessary tables for reduction had been published. A Central Commission was charged with these preparatory labours. The Secretary of this Commission, S. Fradesso da Silveira, was authorised to purchase standards, verified at the Conservatoire des Arts et Métiers of Paris, and to study the practical working of the system in France and Belgium. His mission having terminated in 1855, special agents were sent throughout the country to make a comparison in each commune, with the aid of the municipality, between the old and the new standards, and a verified report of the results was deposited with the authorities, and also sent to the Central Commission. An elaborate government publication not only contains the tables of all these results, but the tables of reduction of all the old measures into the new metric measures, and *vice versâ*, and the same for all the units of English and Portuguese measures. The General Department of Weights and Measures, which took the place of the Central Commission, made provision for teaching the new system of weights and measures in all public and private schools. The consequence of this active and zealous introduction of the system was that, instead of the ten years originally prescribed, the Government felt justified in ordering the new system, as to measures of length, to be enforced from 1st January, 1860, and as to weights to commence from 1st July, 1861. For the service of the Custom-houses, a law of 30th June, 1860, authorised the Government to publish a new tariff of duties in accordance with the new system, which was done in the same year, and the official statistics have since been given in terms of the metric system. The preparatory labours for the introduction of the metric measures of surface and capacity are already completed, and the whole system will in a very brief period be in full operation.

Greece.—The metric system was introduced by the law of 28th September, 1836, but the nomenclature is Greek. For weight, the unit called the mine is $1\frac{1}{2}$ kilogram, and the talent has 100 minen, or 150 kilogrammes.

Italy.—In Sardinia and Lombardy the metric system has long been established, and since the union of the Neapolitan and other Italian states, the system is rapidly extending over the whole kingdom.

Austria.—The half-kilogram, decimally subdivided, has been introduced in the collection of customs, and in the steamboat and railway traffic, without producing any inconvenience, and the florin is subdivided into 100 kreutzers instead of 60. His Excellency, Baron von Czoernig, President of the Central Statistical Commission, reports that they are preparing for the introduction of the metric system in its entirety.

Germany.—As to the other states of Germany, a conference was held in 1860, at Frankfort, at which representatives from nearly all the German powers were present, and after a careful consideration of the whole subject, they recommended the introduction of the metric system, as

the best system of weights and measures for all Germany. At the International Statistical Congress, held in Berlin, in September last, very strong resolutions were passed, both in the section which was specially devoted to this discussion, and in the congress itself, strongly recommending the metric system to be authorized by law in every country not now using it; that an International Commission should be formed, to further its universal adoption; that it should be made compulsory in the shortest practicable period; that each government should institute a department of weights and measures to carry out the details of its introduction; and that wherever it is made permissive only, it should at once be legalized in the customs, and taught in all the schools over which the state has any authority. As these resolutions were the result of a discussion in a section specially set apart for this purpose by the Preparatory Commission of the Prussian Government for the regulation of the Congress, there can be little doubt that Prussia, although not represented at the Frankfort Congress on this subject, will not be behind the rest of Germany in this important reform of her existing system.

Russia.—Since 1858 considerable interest has been excited by the appointment of a Commission of the Imperial Academy of Science, whose report is in favour of the entire introduction of the metric system into the empire. M. Kupfer, the reporter of that Commission, who attended as a delegate from the Russian Government, at the meeting of the International Decimal Association held at Bradford in 1860 (and at which M. Michel Chevalier, the enlightened and eloquent advocate of free trade in France, presided), assured the meeting that if Great Britain would take the lead Russia was prepared to follow, and wholly adopt the metric system.

Sweden, Norway, and Denmark.—A new decimal system of weights and measures was introduced into Sweden in 1855, to be compulsory from the 1st January, 1863. But Mr. Ewart, in his able speech on the introduction of his bill before parliament, 1st July, 1863, stated that, at an important Scandinavian meeting for Political Economy, held on the 20th May preceding, at Gottenberg, at which nearly 500 persons, including members of the Swedish, Norwegian, and Danish Parliaments were present, a resolution was passed that it was expedient to adopt the pure metric system, both for measures, weights, and coins, in all the Scandinavian countries. Since then the late King of Denmark appointed a commission to study and report on the question.

Besides these remarkable testimonies to the rapid progress and popularity of the metric system on the continent of Europe, we find it making an entrance into South America, by being introduced into Chili in 1848, in lieu of the old Spanish system.

Can we suppose, then, that Great Britain, claiming to be the foremost nation of the earth in social progress, in education, freedom of thought, and commercial enterprise, and to whom, on the latter account especially, any system which could get rid of the incongruities and confusion of her present system would be a peculiar boon, cannot accomplish what has been so easily effected by other nations? Is it to be believed that we are unwilling to encounter some temporary, even though great inconvenience, in order by one bold change to come at once into that great community of different nations which we have enumerated as possessing or taking active steps to possess a common system of weights and measures so convenient for their internal trade and the interchange of their productions with other countries?

Few perhaps are aware of the silent but continued progress which has been made within a few years towards preparing the public of this country for the introduction of this system, and of the extent to which its advantages have been recognized. I proceed briefly to state a few leading facts; time will not permit the full details, nor to consider at present so fully as they deserve the other propositions advocated.

Commencing with the Great Exhibition of 1851, I have already mentioned the steps taken by the Society of Arts to draw the attention of the Government to the importance of a uniform and general system. Since then, from the earnest desire of the Council to promote the great objects of the Society, by giving facilities and encouragement to commerce, this hall has been frequently opened for discussions on this subject. The members of the International Decimal Association have met the delegates of the Institutions in Union at a special meeting, and debated the question fully. This was the more important, as the delegates, coming from all parts of the country, and representing the leaders of the industrial classes, would carry back their new ideas to be again discussed in their institutions throughout the kingdom, by the very class who suffer most under the anomalies of the present system, and would be the first to have to bear the inconvenience of a change. Yet the expressions of the speakers were almost unanimous in favour of the metric system, as being a change, although great, final in its effects.

Again, the Council of this Society have, on other occasions, granted the use of their room for the delivery of a series of lectures by Mr. Fellows, Mr. Hennessy, M.P., Mr. R. G. Williams, Mr. Yates, &c., on the inconveniences of the present system, the impediments to the introduction of the metrical system, and the legal and educational questions involved therein. These lectures were well attended, and very numerous invitations were sent out, and the proceedings well reported in the metropolitan and provincial papers.

I trust also that my feeble introduction of the subject this evening will be forgotten in the animated debate, by which the Council will feel their efforts to promote the interests of the public amply rewarded.

The most important step towards popularising the question was the formation of the International Decimal Association, which was formed at Paris in 1855, after the Statistical Congress that had just been held there, and when the jurors and other influential persons attending the Universal Exhibition then at Paris were able to attend. No less than 150 persons of high intellectual or social position, interested in manufactures or commerce, were present, and the meeting was presided over by Baron James de Rothschild, the head of the greatest European banking house, whose pithy and eloquent speech summed up in the fewest possible words the advantages of a common system of weights, measures, and coins throughout the world. The Association then formed owed its origin principally to the efforts of Mr. James Yates, F.R.S., and the influential support of that public-spirited nobleman, the present Earl Fortescue. It is meant to be European, and to have branches in every country, but it is to the English branch, then established, that the growing interest of the public in this question is mainly due. Since then, no opportunity has been lost, by pamphlets, lectures, discussions, petitions to Parliament, deputations to the government on all suitable occasions, at Statistical Congresses, at the meetings of the British Association or Social Science, at the Statistical Society and Institute of Actuaries, at the Chambers of Commerce, at Mechanics' Institutes, by interesting men of all classes and opinions, to promote a free inquiry into the question of unity of weights and measures, not for this country only, but one common to all other European nations. It would be interesting to trace all that has been done since the period of the Great Exhibition of 1851, but time and space do not permit, and we must briefly rest at the stage at which we have now arrived—Mr. Ewart's Committee and its consequences.

The Committee was appointed to inquire into the practicability of establishing a uniform system of weights and measures, with a view to facilitate our domestic and foreign trade. It was fortunate for the latter part of the inquiry that the Committee was sitting during the International Exhibition, when a number of foreign witnesses,

men of science, merchants, and manufacturers, could give evidence of the improvement which the metric system had effected in other countries, and how the difficulties of introducing it could be overcome. The inquiry was eminently practical and the conclusions unanimous.

The recommendations of the Committee were as follows:—

1. That the use of the Metric system be rendered legal, though no compulsory measures should be resorted to until they are sanctioned by the general conviction of the public.

2. That a Department of Weights and Measures be established in connection with the Board of Trade. It would thus become subordinate to the Government, and responsible to Parliament. To it should be intrusted the conservation and verification of the standards, the superintendence of inspectors, and the general duties incident to such a department. It should also take such measures as may from time to time promote the use and extend the knowledge of the Metric system in the departments of Government, and among the people.

3. The Government should sanction the use of the metric system, together with our present one, in the levying of the customs duties; thus familiarising it among our merchants and manufacturers, and giving facilities to foreign traders in their dealings with this country. Its use, combined with that of our own system, in Government contracts has also been suggested.

4. The metric system should form one of the subjects of examination in the competitive examinations of the Civil Service.

5. The gram should be used as a weight for foreign letters and books at the Post-office.

6. The Committee of Council on Education should require the Metric system to be taught (as might easily be done, by means of tables and diagrams) in all schools receiving grants of public money.

7. In the public statistics of the country, quantities should be expressed in terms of the Metric system in juxtaposition with those of our own, as suggested by the International Statistical Congress.

8. In private Bills before Parliament the use of the Metric system should be allowed.

9. The only weights and measures in use should be the Metric and Imperial, until the Metric has generally been adopted.

10. The proviso in the 5th and 6th William IV. c. 63, s. 6, should be repealed.

11. The department which it is proposed to appoint should make an Annual Report to Parliament.

In accordance therewith a deputation, including several Members of Parliament, Mr. Ewart, Mr. J. B. Smith, Col. Sykes, and others, waited upon the Right Hon. Thos. Milner Gibson, President of the Board of Trade, but finding as the result of the interview that her Majesty's Government were not prepared to introduce or support a Bill which would carry out the recommendations of the Committee, the Council of the International Decimal Association, with the support of the associated Chambers of Commerce and other public bodies, respectfully requested Mr. Ewart to introduce a Bill for that purpose. Strong reasons, however, were thought to exist against a merely permissive Bill, which, besides adding another to the many systems already in use, would allow all those who were unwilling to incur the expense and trouble of the change, or who objected to its being taught in schools or used in Government departments to prolong almost indefinitely the period for its general adoption. The original draft was therefore altered to one which made the metric system compulsory after three years, allowing the intervening period to prepare for the change, as we have seen has been the course in the legislation of other countries. On the 1st of July last, on the second reading, a very animated and interesting debate took place. Mr. Ewart made an eloquent and powerful speech, and was supported by Mr. Locke, Q.C., Mr. Pollard Urquhart, Mr. Adderley, Mr. Baines, Sir M. Farquhar, Bart., Mr. Cobden, Mr. Bazley, Mr. Roebuck, Mr. R. Hodgson, Mr. J. B. Smith, Mr. Griffith, and Col. Sykes. The opponents were Mr. Henley and Mr. Hubbard. Mr. Milner Gibson, opposed the Bill on behalf of Government, on the ground that the people were not prepared for so great a change. The Chancellor of the Exchequer also objected to the compulsory character of the Bill and some other members would have preferred a permissive Bill. Though the metric system was approved by the second reading being carried by a majority of 110 to 75, it was considered by Mr. Ewart prudent to defer to the opinions so expressed, and it is hoped that he will, early in the approaching session, introduce such a measure as will secure the favour of the House, and allow the people of this great commercial country to become familiar at least with the merits and advantages of the metric system in actual practice. It is already used in some trades. Machine-makers, engineers, chemists, bear this testimony to it. If once rendered legal, it is only a question of time how long the existing state of confusion, comprising ten legal systems of weights and measures, will remain. "Decimal grains, used for scientific purposes; troy weight, under 5 Geo. IV., c. 74; troy ounce, with decimal multiples and divisions, called bullion weights; bankers' weights; apothecaries' weight; diamond weights and pearl weights, including carats; avoirdupois weight, under 5 Geo. IV., c. 78; weights for hay and straw; wool weight, using as factors 2, 3, 7, and 13; coal weight;" would all give way to one simple and definite system, applicable and convenient for every trade transaction, large or small.

The information given before the different Parliamentary Commitees, on the customary weights and measures in different localities, would be amusing, if it was not so serious and obstructive to internal trade. Soon after the British branch of the International Decimal Association was formed, it was resolved to collect information as to the variety of weights and measures in use in different parts of Great Britain.

"For this end, a circular was sent to municipal bodies, mechanics' institutions, chambers of commerce, and agricultural associations throughout the country. The returns, classified in a table published by the Association, exhibit a very remarkable view of the discrepancies which are found in different localities of weights and measures under the same name. The linear measures of land, for instance, differ from 3 feet, used at Hertford, to the chain of 66 feet, used at Hastings, and include between these limits seventeen different measures in different places. In superficial measures of land, twenty-five varieties exist; and the acre itself varies from 4,840 square yards to 10,240 square yards. Wheat, oats, and barley appear to be sold indiscriminately, by weight or measure, the bushel undergoing all sorts of changes in quantity, and giving place in some districts to the load of 3 or 5 or 40 bushels, of 5 quarters, 144 quarters, or 488lb—to the bag, the stack, the boll, the comb, the windle, the hobbet, the strike, the stone, the barrel, the winch, all differing from each other. For the sale of butter there is the pound, which has in different places 16, 18, 20, 24 ounces, besides the pint, the dish, and the roll. Potatoes, pork, flour, and coals are variously sold by weights or measures having no relation to each other. The measure of timber and brickwork would be equally unintelligible to inhabitants of different localities; and in wool and flax the stone differs from 16 to 24½lb."

Professor Leone Levi also says:—"For measures of length we have the ordinary inch, foot, and yard. In cloth measure, we have yards, nails, and ells. There are four different sorts of ells. For nautical purposes we have fathoms, knots, leagues, and geographical miles, differing from the common mile. The fathom of a man-of-war is 6 feet; of a merchant vessel, 5½ feet; of a fish-

ing smack, 5 feet. We have also the Scotch and Irish mile, and the Scotch and Irish acre. There are several sorts of acres in the United Kingdom, and there are a great variety of roods. We have in almost every trade measures of length specially used in these trades. For the measurement of horses, we have the hand; shoemakers use sizes; and we are compelled to adopt gauges where the French use the millimetre. The gauges are entirely arbitrary. The custom of the trade is the only thing which would decide the question in case of dispute. For measures of capacity, we have twenty different bushels. We can scarcely tell what the hogshead means. For ale, it is 54 gallons; for wine, 63. Pipes of wine vary in many ways; each sort of wine seems to claim the privilege of a different sort of pipe. For measures of weight, we have about ten different stones; a stone of wool at Darlington is 18 lbs., a stone of flax at Downpatrick is 24 lbs., a stone of flax at Belfast is 16¾ lbs., but it is also at Belfast 24½ lbs., having in one place two values. The cwt. may mean 100 lbs., 112 lbs., or 120 lbs. If you buy an ounce or pound of anything, you must inquire if it belongs to Dutch, troy, or avoirdupois weight."

It is true that such discrepancies exist in defiance of existing laws, but they will never be effectually put down till one simple system is taught in schools, and a new generation has grown up after the old systems have been abolished.

Though the metric system appears to be in all respects distinct and opposed to our own, there are several points in which it would nearly accord with existing weights and measures. A meter, which is the basis of all, corresponds to 39·37 English inches, about $1\frac{1}{10}$ yard; 1 pole or perch (5½ yards) = 5·029 meters, about 5 meters; 1 furlong (220 yards) = 201·165, about 200 meters; 5 furlongs = 1,005·822, about 1 kilometer; 1 foot = 3·048 decimeters, about 3 decimeters; the are = 119·5 square yards, nearly 120; the liter = 61·03 cubic inches, or 2·1135 wine pints, nearly 1 quart; the gram = 15·434 grains; the kilogram = 2·205 lbs. avoirdupois; the half-kilogram = about 1 lb.; the ton = 1,015·65 kilograms, say 1,000.

Our exports to countries using the metric system have increased from £23,696,000, in 1847, to £55,242,000 in 1861, an increase of 133 per cent., whilst to countries using the English system they increased only from £16,262,000, in 1847, to £24,211,000 in 1861, or less than 50 per cent. increase.

If the metric system be once legalised in this country we can hardly form an estimate of the immense benefits that would follow to the commerce of the world. Our colonies would naturally, and for their own sakes, adopt the system of the mother country, with whom their trade principally lies. India, which has no common system of weights and measures, but, under the varieties of native governments, is full of incongruous and absurd systems, by which it cannot be doubted the labouring classes especially are exposed to false weights and trade frauds, might by our influence gradually find one simple system prevailing throughout the whole of those vast dominions. The Americans, who have long agitated this question, would not, we are assured by the American delegates who have been sent to our European congresses, hesitate to make the change. They are only deterred now by the disturbance that would arise in their large trade with this country as long as our present system continues. An impetus would be given to Russia and Germany to complete the work to which they are already half committed.

The expression in the old English statute "that there should be but one measure and one weight throughout the land," might be expanded into the grander idea, which would then be almost realised, that there should be but "one measure and one weight throughout the earth." Commerce, the real harmonizer of nations, uniting them in the bonds of mutual interest and growing esteem, would then receive a still greater development than has occurred even in the last few years, diffusing everywhere the blessings of peace, and causing all nations to pause ere they precipitated each other into the calamities of war.

DISCUSSION.

The CHAIRMAN having expressed his personal obligations to Mr. Brown for having introduced a paper on a subject on which that gentleman had had so much experience, in relation to the commerce of different countries, remarked that a great aid to the progress of the metrical system on the continent of Europe had, no doubt, been afforded by the rapid extension of the railway and steamboat system, which so greatly facilitated intercommunication. Treaties of commerce had lately been entered into between England and France and other great nations, and the ministers who met together to negotiate those treaties must have experienced considerable difficulty in arranging the details, owing to the weights and measures being so very different in the countries they represented. Another means of the extension of the metrical system was, no doubt, to be found in the recent abandonment of the passport system on the Continent, a sure sign of the modification of the old selfish policy which had so long existed in different nations. With regard to the English system of measurement, if we looked to its origin, and to the mode in which its basis, the inch, had been arrived at, it was remarkable how unscientific it was. The definition of an inch in the table-books was "Three barleycorns, one inch." The three barleycorns were taken from the middle of an ear of barley as yielding the best specimens of that grain, and the inch, multiplied by 12, was taken to constitute the foot measure. That measure could not have been originally taken from the length of the foot of a man, which, in a person of the ordinary stature of 5 feet 10 inches, did not generally exceed 10¾ or 11 inches. He thought little would be lost by the abandonment of the present system of weights and measures in this country, whilst the advantages of a decimal system were evident. Mr. Brown had shown how much time would be saved in the education of the young, if a simpler system than that now in use were adopted, and Mr. Chadwick, who had gone very deeply into this question, had expressed his opinion that a child educated under the improved system would save one-third of the time at present occupied in mastering the numerous tables and rules now found necessary. Englishmen might be regarded as wharfingers and warehousemen to the rest of the world. We had wharves everywhere, and the flag of this country floated in every quarter of the earth, and no doubt our trade would be greatly facilitated if an universal system of weights and measures were introduced. He had no doubt of the ultimate success of this movement; the only question was the time that would be occupied in effecting it. The only other proposition worth consideration was that we should decimalize our existing weights and measures, but he thought there would be no great advantage in simply altering the foot measure from twelve inches to ten inches, as this would not aid in assimilating our system to that of other great countries. It was a remarkable circumstance that no body of men were more anxious for the proposed change than the chemical profession. The Pharmaceutical Society were amongst the most zealous supporters of the metrical movement. At the meeting of the British Association in Newcastle last year, the subject was brought under the consideration of the chemical section, by whom the following resolution was passed:—"That, in the opinion of this committee, the uniformity of the standards of weight and measure in use throughout the civilized world is a matter of greater importance than the decimal division of the standards now in use, and that the French metrical system is that which is best adapted to the present state of science." The most distinguished persons were upon that committee, and they must be deemed good authorities on the subject. Throughout the whole of Germany the metrical system was held in the highest favour, and in all the aspirations for German unity the idea of uniform weights and measures was a leading feature.

Mr. JAMES YATES, F.R.S., regarded education at the present moment as the best means of introducing the

metrical system, and in directing his attention to that object he had arranged an educational apparatus, which appeared to him eminently adapted to impart a practical knowledge of the subject. It consisted of, 1. An abacus, suited for teaching decimals, together with whole numbers, to the youngest children; 2. A table of arithmetical signs, including the decimal point; 3. A metre, divided into decimetres, centimetres, and millimetres; 4. A centiare, or square metre, for explaining superficial measure; 5. A cubic decimetre, showing its division into 1000 cubic centimetres; 6. A synoptic table, showing all the principal measures and weights, with their derivation and their relation to one another. His plan was to bring before the learner's eye the actual weights and measures, and the system upon which they were divided, and though the object was more especially to teach the use of decimals, the principle was applicable to arithmetic generally. The present methods of teaching were, in his opinion, very defective, and capable of immense improvement. As to the metre, he had considered what would be the best method of teaching its use in schools, and for this purpose he recommended that a standard, accurately divided into the metre, decimetre, centimetre, and millimetre be employed. A measuring tape, having the English measurement on one side and the French on the other, was, in his opinion, a very good means of familiarising the mind with the relations of the metrical system to our own. The next instrument he proposed was the centiare, or the hundredth part of an acre, otherwise a square metre, which should be divided into square decimetres and centimetres. These instruments were useful in making clear to children measures of length and surface. Mr. Yates then proceeded to call attention to the synoptic table of weights and measures, which was similar to the one in general use in France, and which was being adopted in Portugal. For the preparation of this he was indebted to Mr. Dowling, C.E. On this table every one of the weights, measures, and lengths was drawn of the actual size. In one corner of the drawing there was a small representation of the earth, and that was placed there because the metre was the ten-millionth part of the quadrant of the earth from the north pole to the equator. An objection had been made that this was a fanciful and inaccurate standard. On the contrary, he thought it a grand and noble idea, for when it was desired to frame a system adapted to the whole human race, and when the object was to accommodate all the inhabitants of the earth, they could not do better than take the basis from the measurement of the earth itself. The greatest possible care was taken in the matter, and, notwithstanding the objections made to it, there was the greatest accuracy in that measurement.

Mr. Wm. Hawes (Chairman of the Council) said there were two points of view from which this subject must be regarded, viz., the scientific and the practical. As far as science was concerned it was desirable that weights and measures should be assimilated all over the world. The idea was a large one, and might charm the mind of an enthusiast with the notion of an uniform measure leading to universal peace and amity among nations; but looking at the present state of the world, he must be very sanguine who thought such small matters could influence its destinies. It had been advanced, as a question of education, that it took a child three years to learn our present system. They were told that there was a great variety of distinct systems of weights and measures in use in different parts of this country, and they were asked to infer that a child was necessarily obliged to learn all those systems. But this was not the fact. It was only necessary for each child to become familiar with the weights and measures in use in his own particular district. He thought this question of education had been put forward too forcibly, and that the advantages of the decimal system in this respect had been unduly exaggerated. There were other points connected with the subject which well deserved serious consideration. If by Act of Parliament the adoption of the metrical system of weights and measures were made compulsory—of course money would be included—the lists of the prices current of articles would be placed in the greatest confusion, particularly when comparison had to be made with those of former periods, necessarily calculated upon the old system. It would be a serious matter to find ourselves suddenly obliged to transact the whole of our business on an entirely new set of formulæ. The amount of confusion would be so great that nothing but some absolute and practical good could justify such a change being made by Act of Parliament.

The Chairman remarked that it was intended to keep the pound sterling as the unit.

Mr. Hawes—It would not affect the pound, but the thousandth part of a pound would not be a farthing. This would alter the basis of many calculations. They had been told that the trade of this empire had increased more with those countries which used the metrical system than with others, but he could not allow that this was owing to the metrical system, but rather to other causes, such as commercial treaties and the introduction of free trade where prohibition had been the rule for centuries. The trade with France, from two or three millions had become eight or nine millions within the last three years. Had the metrical system anything to do with that?

Mr. Brown explained that his argument was not that the metrical system had produced the increase of trade, but that owing to the increase of trade the assimilation of our system with that of other countries became all the more desirable.

Mr. Hawes thought there would be little or no commercial advantage in the introduction of this system. If a shipment of goods were to be made to France, it was easy to calculate the equivalents to the weights and measures of the respective countries. The whole matter was a question of arithmetic in the counting-house, and did not affect the profit or loss of the transaction. He began his observations by stating that, in a scientific point of view, this change of system might be desirable, but that was only a very small part of the question. He contended that the advantages put forth in the paper as likely to follow the change from one system to the other were greatly exaggerated, and that they were not worth the cost and confusion involved in the change. They had been told of the great facilities and advantages which arose from it in other countries, and yet he found that France, which had taken the lead in this question, required from 1790 to 1840 to bring the system into general use. Under what might be termed a despotic government, it took fifty years to bring about the change in that country, and in a free country like this a much longer time would be required. Many persons present were old enough to recollect the time when the ton, which was formerly so variable, was declared by Act of Parliament to be twenty cwt., and they also knew for how many years that Act was evaded. To introduce the metrical system as compulsory, he thought would be unwise—if it was beneficial it would introduce itself. A Society like this might point out the advantages of a permissive enactment, but let them not be too sanguine of its being generally or rapidly adopted. Its commercial difficulties were so great that he did not think that men of business would receive it with anything like encouragement.

Mr. Ogilvie said he would not have presumed to offer any observations on this subject if he had not had some experience of the working of this system. He thought the metrical system was practical and useful, easy to learn, and more easy in application. At the same time those who had had anything to do with introducing important changes of this kind were aware of the difficulties attending that operation. He thought this question should be viewed under two aspects, the international and the national. Under the existing facilities for the interchange of the productions of different countries, he believed the metrical system would be of great benefit to commer-

cial men, and he thought after a little education they might with great facility transmute one system into the other. He did not for a moment advance the Utopian idea that all these commercial relations would immediately produce an universal peace, but that would be the ultimate tendency of such a course. This question should also be viewed in its national aspect as regarded our home and domestic trade. They would find some difficulty when they came to the transactions of retail trades. In the multitudinous purchases made in the metropolis, on Saturday nights, if persons were compelled at once to make the change, a good deal of difficulty would be experienced. Again, there would be difficulty in establishing the universality of this system. Even now in France a difference existed in various parts of the country. In one part they stated the price of things in francs and centimes, and in another part in francs and sous. These difficulties of detail, he believed, would be ultimately overcome, and for these reasons he thought the metrical system would be useful, and ought, if possible, to be introduced into this country.

Dr. De Meschin thought the practical advantages resulting from any new scheme should be looked at rather than the difficulties by which it was accompanied. Mr. Cobden had stated that he never knew a cause so much supported by the concurrent testimony of practical and scientific men as this one. He (Dr. De Meschin) admitted some of the difficulties Mr. Hawes had alluded to, at the same time he thought the resulting advantages would outweigh those difficulties. The decimals of the pound sterling were so well known in this country that he thought there would be no difficulty in that respect. With regard to the length of time that had been required for the full introduction of the metrical system in France, it should be remembered that the First Napoleon was very much opposed to modern ideas, and set his face against it at every opportunity.

Mr. F. Lawrence remarked that this question must be looked at, not as to the way in which it would assist the foreigner, but as to how it would benefit the people of this country. With regard to the commercial transactions of this country, would any one say that the French kilogramme offered greater facilities than the English pound weight? He considered the metrical system entirely founded on a mistake, in taking so small a standard as the gramme. In this country we had the pound and the ton, which were each suited to certain purposes. We must change the whole of our weights to assimilate them with those of France; and could it be said that our yard was not practically as good as the metre of France? They must also consider what would be the expense of this alteration in providing the new measures and weights throughout the country. He believed this would not cost much less than ten millions of money. What would be the advantage to consumers of gas to pay for it by the cubic metre instead of by the thousand feet? Did it facilitate calculation? Not at all. The present system was adopted in a staple trade of this country very much larger than the cotton trade—that was the iron trade. There they had tons, cwts., quarters, and pounds. There was great facility in this; because for every pound sterling in the price per ton there was a shilling per cwt. They had no such facilities in the metrical system, which, in that trade, would impede rather than aid calculation. This country had immense dealings with America and our colonies. He presumed, in Mr. Brown's statement as to the increase of trade, the transactions with our colonies were omitted. That statement led them to believe that we had larger commercial dealings with countries having the metrical system than with others. This was founded in error, because the whole of our colonies had been omitted. Our trade with America was five or six times as great as that with France. If we joined ourselves to France by the adoption of this system, we severed ourselves from America, which used the yard as a unit. The whole system, at first sight, looked very tempting, but he could not admit that there was any real advantage in deriving the standard from the measurement of the earth's arc. He thought this metrical unit was propounded by scientific radicals, whose only idea was to form a totally new system—to sweep away everything that existed and begin anew. The revolutionists in France not only swept away the old weights and measures, but they also swept away years and months from the computation of time, and, in that respect, they seemed desirous to begin the world anew. Although is was seventy years since the metrical system was introduced in France, it could scarcely be said, even now, to be in use for the every-day business of life.

Mr. Franklin was glad that in any case the English sovereign would be retained as the unit of money in this country, inasmuch as it would be the best means of preparing the public for the alterations proposed in our weights and measures. The great question was how to make the masses of the public appreciate the advantages which this system promised. If they gave the workman the means of decimalising his money, it would prepare him for decimalising his weights and measures. If the objections hitherto advanced against the decimalisation of the coinage of this country were removed, the great obstacle to decimalisation generally would be got rid of, and then the public would be able to determine as between the established system and that which was substituted in its place. He thought it should be adopted from a conviction of its utility, and not made a compulsory Act in this country. Whatever they did he recommended them to keep the standard of the value of the coinage in their own hands. He hoped the International Association, by whom this subject had been so much ventilated, would be the means of paving the way to a better understanding of it by the public at large.

Dr. Waddilove said although he possessed no practical acquaintance with education or commerce still he could not but think that in a common-sense point of view it was desirable, if possible, that the metrical system should be introduced into this country. We had now a great variety of weights and measures throughout the kingdom, and he would put the simple question—supposing they were about to found a new colony and to introduce weights and measures into it, would they institute the incongruous system which at present existed in this country? He was satisfied they would not. Then, why should they maintain the present system? They were told it was difficult to alter it, and that great cost and trouble would be incurred in so doing. On one occasion we altered the "style," and there was a great outcry throughout the country on account of the innovation; but now we were reconciled to it and duly estimated its advantages. In like manner he believed they would eventually estimate the advantages of the metrical system.

Dr. Farr said two or three matters had arisen in the course of the discussion which seemed to require a few words of explanation. As a member of the International Decimal Association he felt very grateful to the Society of Arts for the opportunity thus granted of presenting the views of that association for discussion, and he believed that advantage would be derived from hearing the opinions of those who, like many present, had done much for the progress of industry both here and in other countries. As a statistician himself he would first speak of the application of the metrical system to statistical purposes, and he would say that the most eminent statisticians of Europe were agreed that it would be a great advantage if the statistics of a kingdom were expressed in the decimal system, and after a great deal of thought they decided that having a scientific system like that of the French in existence, it would be absurd to introduce a new one, even though more perfect, at the risk of its not being adopted by other countries. The French system was based upon certain units of convenient size, and they had subdivided those units decimally. His friend Mr. Hawes had very properly said they must have regard to practical utility in these matters, but it was found that

the practice of scientific men all over the world was to adopt certain units, and then decimalise them. In engineering it was found necessary to decimalise our weights and measures. Mr. Brown, being himself an actuary, found it convenient to decimalise the pound sterling; and the Astronomer-Royal had stated that all his observations were calculated upon the decimal system. The desire was to give to the commercial world the advantages which were now monopolised by the scientific world, and those, he submitted, they would enjoy under the French metrical system. Nobody could reasonably hope that the adoption of the metrical system would produce universal peace; but that it would tend to diminish the disputes between the commercial communities of different countries there could be no doubt, whilst it would certainly simplify all their business accounts. The grand reason why they were asked to alter their present absurd system of weights and measures in this country was that there was no simple relation between them. The system was not decimalised, and it would require as much change to decimalise from the yard as to introduce the metre and decimalise from it. He therefore thought it was desirable to accept the French system as a whole, for it was both scientific and remarkably convenient. It was true that those who established it did not adopt the then existing French unit, but there were a great number of units in existence at the time alluded to, and they adopted one which it was hoped the nations of Europe generally would agree to. With regard to our ton, it need not be disturbed, for the thousandth part of a ton was very near the kilogramme. They did not want more than two or three units in measure and in weights. For measuring roads they would take the kilometre, and for shop measurements the metre. He was persuaded that in the matter of education fully a year was wasted by the children in learning tables, many of which they forgot as soon as they left school. Mr. Hawes had raised a practical objection to this system in the matter of the quotations of commercial prices current, but they were not of any serious importance, as the differences were calculated approximately with but little difficulty, no error of any real consequence being involved.

Mr. HAWES said the small differences referred to by Dr. Farr would be an important matter in the profit or loss in a commercial transaction.

Professor LEONE LEVI briefly expressed a hope that the Society of Arts, from whom the International Association had hitherto received such valuable aid, would not withdraw its support from this movement. He suggested that the numerous publications on this subject should be as extensively circulated as possible amongst the Institutions in Union with the Society, as the best means of awakening consideration of the subject. Prizes might also be offered to teachers of schools who should pass an examination in the metric system, and the subject might be included in the annual examinations. The Society having already petitioned the House of Commons in favour of a universal system of weights and measures in this country, he hoped they would not retrace their steps, and when the measure was again brought forward by Mr. Ewart, next session, he should be glad to see the signature of the present Chairman of Council (Mr. Hawes) attached to a similar petition to that which was presented on a previous occasion.

Mr. BROWN, in reply upon the discussion, said with regard to Mr. Hawes's observations, they tended to the maintenance of any system, however cumbrous, which it was difficult to change. It was not proposed that this system or any other should be suddenly introduced and made peremptory. Whatever was done by the legislature or the public, it was expected that time should be allowed for proper instruction in and understanding of the system, and that when the public mind was prepared for the change they should have as perfect a plan as could be devised. Mr. Lawrence appeared to entertain an objection to the proposed change of nomenclature, but he (Mr. Brown) had no particular affection for this or any other nomenclature—only let the principle of the system be recognised, and he did not care how the sub-divisions were named. As to the introduction of the system by "scientific radicals" they might go further back than that for the origin of the scheme, viz., before the commencement of the revolution in France, but the knowledge of the subject was so advanced during the revolution that the people were better prepared than those of other countries to accept this scientific system. With regard to its effects upon our American trade, the Americans now traded largely with countries using that system, and a delegate from America had stated to the International Association that that country was prepared to follow England in the lead she might take in this matter. Therefore no fears need be entertained on those grounds. The same might be said of Russia and the whole of Germany. It was worthy of a country possessing the largest trade in the world to take the lead in this important step, and if England made the change it would influence a great many other countries to do the same.

The CHAIRMAN then proposed a vote of thanks to Mr. Brown for his interesting and valuable paper.

The vote of thanks was then passed.

The SECRETARY called attention to some specimens of fine zinc wire and zinc wire gauze, sent by Mr. James Spratt, the latter stated to be the first zinc wire gauze ever woven.

It was announced that on Wednesday evening next, the 3rd February, a paper by Mons. E. Vial (of Paris), "On Instantaneous Engraving on Metal," would be read. The paper will be illustrated by experiments.

The following letter has been received:—

SIR,—It is of great importance, when discussing the question of the policy of introducing a new system of weights and measures, that the facts stated should be accurate, and to be relied upon. I therefore append the exact figures as to the exports to countries in which the metric system is used, which are referred to in Mr. Brown's paper. In that paper it is stated that the exports to countries using the metric system had increased 133 per cent. from 1847 to 1861; and that the increase to countries not using it had only increased 50 per cent. The facts, however, which I extract from the same tables as those used by Mr. Brown, are that the exports to countries in which the metric system is entirely or *partially* adopted have increased from £23,600,000 in 1841, to £55,200,000 in 1861, or 133 per cent.: that the exports to countries where the English system is adopted have increased from £16,261,000 in 1841, to £24,200,000 in 1861, or 50 per cent., but (and this table Mr. Brown has omitted) the exports to countries where neither the English nor the metric system is in use, have increased from £18,880,000 in 1841, to £45,600,000 in 1861, or 150 per cent. Without questioning the accuracy of these figures, though, from a hasty glance, I think we should not all agree in the division adopted, I leave them for the consideration of your readers. —I am, &c., W. HAWES.

Proceedings of Institutions.

BACUP MECHANICS' INSTITUTION.—The twenty-fifth annual *soirée* of the Bacup Mechanics' Institution was held on New Year's Eve. The President (Lawrence Heyworth, Esq.) said it was with the greatest pleasure that he again appeared amongst them on the anniversary of their very valuable institution. He was there some 25 years previously or more, when the Institution was just commenced, and he was happy to say that he had been enabled to attend twenty-five times. That to him was a great gratification, but it was still greater to see the improvement in the population of the neighbourhood, which he accounted for in a great measure by the education im-

parted in that Institution.—Mr. Thomas Newbigging, the secretary, read the directors' report, which showed that the efficiency of the Institution had been maintained in all its departments. The directors, however, regretted that out of a population of 18,000 or more, only 340 should avail themselves of the advantages offered by the Institution. To the library had been added more than £60 worth of books. The issues during the year had been 6,439. The series of Wednesday evening lectures (21 in number), which terminated in March last, proved eminently satisfactory, and left a small balance in favour of the Institution. The average attendance at the day school was 204; there were on the books 240. A better attendance at the night school was desirable. The female classes were well attended, and the pupils were making progress. Twenty-four certificates, and prizes the money value of which was about £12, had been gained by members at the Society of Arts and other examinations during the year. The treasurer's account showed a balance in hand of £7 12s. 11d., the receipts for the year being £378 2s. 2½d. —Wm. Fairbairn, Esq., LL.D., said, after listening to the report, he had to congratulate them upon the means provided for the benefit of the members of the Institution. It was said that knowledge rightly applied was power, and so it was. He used the word "rightly" to show that all their attainments should be devoted to some useful purpose. A sound judgment united to goodness of heart was a reward which princes might envy. Success was the reward of industry, and gave them the pleasing reflection of having done their duty. Some people objected to too much work, but he believed they were more injured by idleness than hard work.—Thomas Lawton, Esq., agent of the Lancashire and Cheshire Association of Institutes, seconded the adoption of the report.—Barnett Blake, Esq., said it was impossible to conceive of a greater evil than that of a population growing up without any means of education after the limited tuition which they received at school. He would refer to Durham and Northumberland, which had been induced by the dictation of a trades union, without the least shadow of reason, to clamour for a higher rate of wages for the same amount of labour. The population of Lancashire and Yorkshire was greater than in any other part of the kingdom, and had suffered greater privations without complaining. That was the result of such institutions as those, which had taught men to reason and think rationally upon things. —The annual meeting took place on Wednesday evening, Jan. 6, for the purpose of electing officers for the ensuing year. Mr. Greaves occupied the chair. Various subjects of interest relating to the welfare of the Institution were discussed, and hearty votes of thanks were given to the different officers for their past services, and to the chairman for presiding.—An extraordinary general meeting was then held, and alterations were made in the rules with a view to providing that only one-half of the directors should retire from office annually, instead of the whole, as before.

BRISTOL ATHENÆUM.—A series of Monday popular concerts are being given here every week, much of the music being of a classical character. The prices of admission are—front seats, 1s.; second seats, 6d.

FARNHAM YOUNG MEN'S ASSOCIATION.—At the recent annual general meeting the election of officers for 1864 took place. The balance-sheet to December 31st showed that the expenses had been £125 15s. 3d., and that there was a balance due to the treasurer of £11 0s. 8d. The opening lecture of the second half-session, 1863-64, was delivered on Friday evening, January 15, by Rev. A. B. Alexander, of Reigate, subject: "Ants and Bees." The Lord Bishop of Winchester presided. The lecture was illustrated by a series of diagrams explanatory of the lives and habits, anatomy and physiology of the white and other ants, and the more common species of English bee.—A vote of thanks to the lecturer was passed, after some remarks on the subject by the bishop.

MOSSLEY MECHANICS' INSTITUTE.—On Wednesday, the 6th January, a lecture on "The Chemistry of Common Life," was delivered here by Dex Bean, Esq., who interspersed his remarks with a variety of interesting experiments. The chair was occupied by Mr. R. H. Buckley.

STALYBRIDGE MECHANICS' INSTITUTION.—A bazaar and art treasures exhibition has been held recently, to assist in clearing off the debt incurred in the erection of the new building. The Institution was first formed in 1825, having thus had an existence of more than thirty-eight years. It met at the commencement in a schoolroom, and continued there until the year 1858. Various efforts were made to obtain a new building, and in 1828, Robert Platt, Esq., promised to pay the difference between the rent of the schoolroom and more suitable premises. The committee at once accepted the offer, and removed to better premises, the beneficial effect of the change being felt in the acquisition of nearly 200 members in about three months. These premises were still too small, when, in 1860, Ralph Bates, Esq., promised to give £50 towards the erection of a new institution. Subscription lists were issued, and among the donations promised were £200 by Mr. Robert Platt, £200 by Messrs. T. Harrison and Son, £200 by Mr. John Leech, £150 by Messrs. Wagstaff and Co., £100 by Mr. John Cheetham, &c. In addition to these sums, Col. Astley gave the site for the building and £100 in money. This gift of Col. Astley was considered to amount to nearly £1,000. In July, 1862, the new Institution was opened. It cost £4,070, towards which about £2,000 (exclusive of the land) was raised by donations, and the remainder was borrowed. The debt on the building is thus about £2,000. The bazaar and exhibition remained open for a week, being opened and closed by the President, who in his closing speech said that probably since the Art Treasures Exhibition in Manchester, there had not been an exhibition in the north of England which had surpassed this one. The ironwork which had been displayed at the bazaar was really a splendid sight, and he believed no other bazaar had ever had a similar stall. It was completely cleared out.—The gross receipts were about £1,400, and the expenses would probably be £200, which would thus enable them to reduce the debt from £2,000 to £800.

Manufactures.

THE POTTERS' NEW DRYING CHAMBER.—It will be remembered that among the causes injurious to the health of the artisans employed in the manufacture of pottery, as insisted on in the report of the Commissioners appointed to report on this industry, that of the exposure to great alternations of temperature, in carrying and placing the ware in the drying rooms, was one of the most generally felt and complained of. The notoriously defective arrangements heretofore adopted have led to some few attempts to introduce better—attempts which were fostered by the prize offered by Mr. Elijah Jones. In the appendix to the Commissioners' report, plans are given of a potters' drying stove, as adopted at Messrs. Pinder and Co.'s works, at Burslem, from the design of Mr. Boulton. This form of drying stove presented great advantages over the rude arrangements generally in use; but still more simple and efficient drying rooms have been recently introduced at the works of Messrs. Minton and Co., Stoke, and Messrs. Liddle Elliot and Son, Dalehall, which entirely remove all the hitherto attendant evils of the drying process on the health of the workmen and boys, and at the same time facilitate the operation. The principle of these plans is a rotating cylinder, which in the one case is placed vertically, and in the other horizontally. Both are fitted with shelves, and inclosed in a chamber furnished with flues, so that a uniform heat is maintained at all parts. The cylinder is sub-divided into several sections, and is easily turned as required by the hand of the mould-runner, Each of these is filled in rotation with the greatest facility.

through an aperture for the purpose, and with very little escape of heat. Both are excellent inventions for their simplicity. Experience will, however, prove which of the two is most serviceable and most readily worked. These drying chambers may be seen in operation at the factories of Messrs. Minton and Co., and Messrs. Elliot and Son, who invite the inspection of all engaged in pottery manufacture.

SILVERING GLASS.—A process, said to be an improvement on *Foucault's*, for silvering glasses for telescopic purposes, has been invented by M. Martin, and both are on the same principle as Drayton's, which was rewarded by the Society in 1847. Martin makes use of four liquids, viz., first, a ten per cent. solution of nitrate of silver; second, liquor ammoniæ, sp. gr. ·970; third, a four per cent. solution of caustic soda; and fourth, a 12½ per cent. solution of white sugar, to which he adds ½ per cent. of nitric acid, and after twenty minutes' boiling he adds to it twenty-five parts of alcohol and water to make up the bulk to 250. The silvering liquid is made by mixing together twelve parts of solution No. 1, eight parts of No. 2, twenty parts of No. 3, and 60 parts of distilled water, and finally, in twenty-four hours, ten parts of No. 4. The object to be silvered is then immersed, when it will be covered with a film of reduced silver, which in ten minutes' time will be sufficiently thick for use. After having been washed with distilled water and dried, the surface may be polished with chamois leather and rouge.

CASHMERE SHAWLS.—The Maharajah of Cashmere is taking steps to check the further deterioration in the quality of shawls manufactured in his dominions; and with this view he has issued a circular to the manufacturers, with strict rules for regulating the manufacture. It appears that in Cashmere the number of men and women employed in the occupation of shawl-weaving aggregates 70,000, in fact, nearly all the inhabitants of that far famed city are connected with the trade. Owing to the dulness of the market in England and France, caused chiefly by the inferior description of shawls manufactured, many tradesmen and merchants have been subjected to heavy loss and some to bankruptcy, and a large proportion of weavers have been thrown out of employ. On the Maharajah's late tour through Cashmere the circumstance occupied his chief attention; and from the information he obtained he ordered a set of rules to be established in order to aid both manufacturers and traders.

DUBLIN EXHIBITION.—The prospects of the exhibition of Irish manufactures for 1864, in connexion with the Royal Dublin Society, are said to be most favourable. A guarantee, amounting to more than £8000, has been readily subscribed, and a meeting of the guarantors was held on the 22nd January, in order to appoint a finance committee. A report was read, giving an encouraging account of the response which the general committee had met throughout the country to their appeals for co-operation. It was anticipated that the exhibition would be well supported by the Belfast merchants, who came forward in a liberal spirit. The object of this display is to accumulate Irish manufactures only, and especially to show what progress had been made in Ulster with flax. A strong hope was expressed that this exhibition would be the means of developing the woollen and linen trades in Ireland.

Commerce.

BONELLI'S TYPO-ELECTRIC TELEGRAPH.—A practical demonstration of the working of this most ingenious invention was recently made before a party of scientific and other gentlemen interested in electrical subjects. The inventor of this telegraph is the Chevalier Bonelli, Director of Sardinian telegraphs, whose beautiful and ingenious electric loom was described before the Society in February, 1860, and this telegraph is in reality an adaptation of the same principle to the transmission of messages. The *modus operandi* of this telegraph is extremely difficult to make intelligible without either seeing the instrument at work or diagrams. The principle however on which it works is as follows:—The message to be sent is, at the transmitting end, set up in metal type, similar to that used for printing; there is a small, fine metallic comb, of five teeth, insulated from each other, and each connected by means of a separate wire, with five separate metallic points at the other end of the line resting on a chemically prepared paper, on which the message is to be received. Connection with the battery being made, the type is moved under the comb, the five teeth of which thus pass over it, making and breaking contact according to the form of each letter as it passes, and thus permitting the current of electricity to pass during each contact to the points at the other end, decomposing the chemicals, and marking the paper, which has a motion given to it similar to that of the type. Thus the form of the type becomes impressed on it, being made up of dots and lines of varying lengths, corresponding to the contacts of the five teeth with the surface of the types. The arrangement by which this result is produced may be thus described:—Let the reader suppose himself to be the operator; before him he will find an oak table, six or seven feet in length, seventeen to eighteen inches wide; along the centre of this table runs a miniature railway, terminated at each end by a spring buffer, and spanned midway by a kind of bridge, six inches in height and two and a half or three inches wide. Upon this railway is placed a kind of waggon, one yard long and five inches wide, three and a half inches in height, running upon four brass wheels. On the surface of this waggon are two long rectilinear openings—the one occupying the upper half, and destined to carry the message which is to be sent, the other occupying the lower half, and intended for the message which may be to be received; upon the bridge are two small metal combs, each containing five insulated teeth, answering in number to, and connected with, the insulated conductors of which the line is formed. The combs differ from one another, the one which is to despatch the message, formed of teeth having a certain freedom of action, is on the side of the bridge farthest from the operator; the other, or writing comb, consisting of a similar number of teeth fixed in a block of ivory, side by side in a line the width of the type, rests with a slight but regular pressure transversely on the paper, and occupies the nearer portion of the bridge. These points are made of platinum-iridium alloy. We will suppose that the tables have been tested, and that a number of messages have been sent for despatch; these messages are distributed to a given number of compositors, who set them up in ordinary type with great rapidity; the first that is finished is handed to the operator, whose waggon has already been pushed to the upper end of the rail, and is held there by a simple catch; he places this despatch in the opening destined for it, and on the second opening he places a piece of metal upon which has been laid four, five, or six strips of paper prepared with a solution of nitrate of manganese; this done, he turns a small handle, giving a signal to the operator at the other end, and watches; if the operator at the other end has done his work, the waggons are at once freed from the catch, and are set in motion by a simple weight, the pace being regulated by a fan; the type of one waggon is thus brought under the action of the despatching comb, and runs lightly under its teeth from end to end of the prepared paper, or the other waggon is brought under the receiver's point at the other, and the message will have been printed in clear legible characters, of a deep brown colour, answering with fidelity to the forms over which the corresponding type comb has passed; the message is stripped off, the waggon remounted, the type-box changed, and the process of transmission and reception repeated. As the apparatus at each end is adapted for both transmission and reception, if the operator at the other end has a message to send, it is printed in the

same manner, so that no time is lost. All this, which takes so long to describe, is so rapidly accomplished, that from 450 to 500 messages, of 25 words, may be despatched per hour, the passage of the waggon occupying ten to twelve seconds, during which time two messages have been sent and one received at each end of the line. The printing by means of chemically prepared paper is not new, nor is the production of the message in letters, but the methods hitherto employed have required an absolutely perfect isochronism in the movements of the tracers at the one end and the pen point at the other. Bonelli's system is not dependent on this isochronism, and the message is perfect, even should the carriages at each end of the lines move with a considerable difference of speed, though in practice the carriages are readily adjusted to run at an approximately equal rate. It may be said that five wires are required in this system, while only one is necessary in that of Morse—but it is stated in reply that more than five times as many messages can be sent in the same time, and hence that the difference is in favour of Bonelli. The message, too, requires no interpretation and copying; the strip of paper with the message in printed characters is taken off the machine at once, and forwarded to its destination without loss of time, and without chance of error from transcribing. The whole arrangement is full of ingenious contrivance. In order to get rid of the polarization which would occur at the ends of the receiving points, there is an ingenious arrangement for sending through the line reversals at each signal, a positive current being sent each time the tooth of the comb comes in contact with the type, and a negative current whenever it is insulated. This instrument has been for some time at work commercially between Manchester and Liverpool, and it is now proposed to connect the metropolis with those towns, and the promoters confidently expect that whenever it is established they will be able to reduce the price of messages at least one half. That the system will act successfully on long land lines to the extent of 500 miles, and on short submarine lengths, there is but little doubt, but there would be considerable reason for doubting whether it could be made to work through long submarine cables.

Petroleum.—In 1861 the value of the imports into Europe of this earth oil were but £100,000; in 1862 the value had risen to one million, and last year the value of the imports into Europe from America reached £3,000,000. These figures afford ample comment demonstrative of the progress of petroleum up to the present date. Its position is stamped as one of the most prominent and staple products of nature. In 1862, 59 vessels brought to Liverpool 80,050 barrels and 2381 cases of crude and refined. Last year 80 vessels brought to that port 154,689 barrels and 10,992 cases of crude and refined American. Canadian oil has been so unsatisfactory, such a perfect nuisance to all Europe, from the odour emitted, that the trade, echoing the wishes of the authorities, exclude it altogether.

Street Traffic of London.—The *Railway News* says: Various expedients have been proposed for relieving the pressure of the street traffic in the City of London,—among the more important of which are new railways, new police regulations, and new streets. The difficulty of solving the problem will be obvious from the mere statement of the facts of the case. On every business day in London upwards of 700,000 persons enter the City by its various approaches, and leave it again in the evening for their homes, at the West-end, in the suburbs, or in the country. Seven hundred thousand persons represent a population equal to the whole inhabitants of South Wales, or of the City of Manchester. Drawn up in line, two deep, standing close together, they would occupy an extent of over 120 miles; and ranged six deep, they would take more than twelve hours to march past a spectator at the rate of 110 paces a minute. Of the 700,000 persons and upwards entering and leaving the City daily (exclusive of those entering the West-end and other parts of London), it was ascertained by the officers of the City Police, in the month of May, 1860, that an average of 535,000 proceeded on foot, and 171,000 in vehicles, making a total of 706,000 persons. The number of vehicles ascertained at the same time to enter the City every twenty-four hours was 57,765, which, if drawn up close in line, would occupy a length of about 260 miles, reaching from London to York, and extending more than fifty miles beyond the latter place. The closeness with which the vehicles follow each other in the streets may be inferred from the fact, that between ten and eleven a.m., on Wednesday, the 19th November, 1862, it was ascertained that the total number passing Bow Church, in both directions, was 1,255, of which 348 were omnibuses, 584 cabs, and 282 carts, drays, vans, and waggons, besides 41 trucks and barrows. The numbers and proportions of vehicles passing the same place between four and five p.m. on the same day were ascertained to be as nearly as possible the same. It is not, however, merely that these vehicles pass into the City and out of it daily, but they bring goods to be discharged from them, or they come for goods to be loaded into them, as the case may be, at the various shops and warehouses in the City. While this is being done,—and the bales of dry goods, parcels of groceries or ironmongery, barrels of oil, wine, spirits, or beer, are passing between the vans, waggons, and trucks, and the warehouses,—the thoroughfares are more or less interrupted, occasioning those blocks of street traffic of which we have recently heard so much. London is fast becoming, if it has not already become, the great distributive centre, not only of the produce of England, but of the world at large. Goods from Manchester, Glasgow, Birmingham, Leeds, Sheffield, Nottingham, and the other manufacturing towns are poured into London, and from thence distributed not only to Europe, India, China, and America, but to the rest of England itself,—the goods in many cases being sent back to be sold by wholesale and retail in the very manufacturing towns from which they had originally come. Even the fish caught round our coast are first sent to London, to the great fish contractors, who distribute it in all directions; the fish being, in many cases returned for consumption to the very fishing towns where it had been first landed. In like manner London has become the centre of the Scotch and Irish salmon trade, and of the Scotch and Continental cattle and meat trades. The surplus corn and fruit of the world find their way first to the London markets, through which they filter out to the other home markets, or are floated away to foreign parts. London, too, has become the central market for the precious metals of the world; and gold and silver are now as regular articles of import and export as butter and cheese. Raw materials from all quarters—tea and silk from China, rice and indigo from India, sugar from the West Indies and the Brazils, wines from France and Portugal, tobacco from Virginia and Cuba—are landed in London, and pass through our docks and warehouses, from which they are distributed by our merchants all over the country, and through innumerable branching arteries reach, in detail, the great body of the people. The City authorities have obtained certain new powers, the judicious exercise of which has already had the effect of considerably mitigating these blocks of the main City thoroughfares. But something more is expected of the City authorities than police regulations, however stringent. We want wider thoroughfares; and they may depend upon it that nothing else will satisfy the public requirements. Compared with Paris, for which a despotic Government has done so much, the streets of the City of London are disgraceful. It is true the City surveyor recommended, before the Traffic Regulation Committee, that more railways should be made in the City; by which means he assumed that the pressure on the traffic would be relieved; but when the new railway termini have been opened, there will be far more street traffic than ever, and moving in a far more limited area. The plain fact is, that it is not so much railways as streets that are wanted. To provide effectually for the proper accommodation of the traffic of London, the City authorities must do as the

Parisian authorities have done—widen the streets. "It is a perfect delusion," said Sir Richard Mayne, "to suppose that anything will effectually relieve the traffic of the streets of London except widening the streets." No doubt the process is a costly one; but London is rich, and is willing to be improved; and the time has arrived when the London thoroughfares must have relief at whatever cost.

Colonies.

NEW ZEALAND EXHIBITION IN 1865.

A commission has been issued by the Governor of New Zealand "for the holding of an Exhibition of the products and manufactures of New Zealand, and such products and manufactures of other countries as may in the opinion of the Commissioners be eminently calculated to be useful in the development of the colony."

The Commissioners, in their official communication, "trust that all friends of New Zealand will assist them in their design to make the resources and capabilities of the colony widely known, and to show to colonists such products and manufactures of other countries, and especially such machines to economize labour as might usefully be introduced here."

The following are the principal "decisions" of the Commissioners likely to be of importance to English exhibitors:—

1. The Commissioners have fixed upon the first Tuesday in January, 1865, for opening the Exhibition.

2. The Exhibition building, with such annexes as may be necessary, will be erected in the City of Dunedin.

3. The principal building will be of brick and cement. The annexes for machinery, &c., will be erected adjoining the main building.

4. The decision whether goods proposed to be exhibited are admissible or not, must in each case eventually rest with the Commissioners.

5. Subject to the necessary limitation of space, all persons, whether designers, inventors, manufacturers, producers, or possessors of articles of New Zealand origin, or of such others the produce of other countries as may in the estimation of the Commissioners be eminently calculated to aid in the development of the colony, will be allowed to exhibit; but they must state in what character they exhibit.

6. The Commissioners will communicate with New Zealand Exhibitors only through the Local Committee of their respective Provinces, and with those of neighbouring Colonies, of Great Britain and Ireland, and of Foreign Countries, either through the Agent in London or directly through the Secretary in Dunedin.

7. No rent will be charged to exhibitors.

8. Subject to decisions 5 and 6, every article produced or obtained by human industry will be admitted to the Exhibition, belonging to any one of the four following sections:—I. Raw materials. II. Machinery. III. Manufactures. IV. Fine Arts.

The exceptions are—Living animals and plants; fresh vegetables and animal substances liable to spoil by keeping; detonating or dangerous substances.

9. Spirits or alcohols, oils, acids, corrosive salts, and substances of highly inflammable nature will only be admitted by special written permission and in well secured glass vessels.

10. The articles exhibited will be divided into forty classes under the above four sections.

11. Prizes or rewards for merit in the shape of Honorary Certificates will be given in Sections I., II., and III. These certificates will be of one class for merit without any distinction of degree. No exhibitor will receive more than one certificate in any class or sub-class. A jury will be formed for each class of the exhibition by whom the certificates will be adjudged, subject to general rules, which will regulate the action of the juries. The jurors will be chosen by the Commissioners. The names of all the jurors will be published in January, 1865. The juries will be required to submit their awards with a brief statement of the grounds of each to the Commissioners before the 10th day of March, 1865. The awards will be published in the exhibition building at a public ceremony, and will immediately afterwards be conspicuously attached to the counters of the successful exhibitors, and the grounds of each award will be very briefly stated. If an exhibitor accepts the office of juror, no certificate can be awarded in the class to which he is appointed, either to himself individually or to the firm in which he may be a partner. The certificates will be delivered to the exhibitors on the last day of the exhibition.

12. Prices may be affixed to articles exhibited.

13. The Commissioners will be prepared to receive all articles which may be sent to them on and after the first day of October, and will continue to receive goods until the twelfth day of December, 1864, inclusive.

14. Articles of great size or weight, the placing of which will require considerable labour, must be sent before the 21st of November, 1864; and manufacturers wishing to exhibit machinery or other objects that will require foundations or special constructions must make a declaration to that effect in their demands for space, which demand the Commissioners must receive at least three months previous to the day of opening.

15. Any exhibitor whose goods can properly be placed together will be at liberty to arrange them in his own way, provided his arrangement is compatible with the general scheme of the exhibition and the convenience of other exhibitors.

16. Where it is desired to exhibit the process of manufacture, a sufficient number of articles, however dissimilar, will be admitted for the purpose of illustrating the process, but they must not exceed the number actually required.

30. Regulations will be adopted by the principal steam companies and others trading to Dunedin, with the view of affording facilities for the conveyance of goods to and from the exhibition.

35. As a general rule, no counters or fittings will be provided by the Commissioners. Exhibitors will be permitted, subject only to the necessary general regulations, to erect to their own taste all the counters, stands, &c.

43. Exhibitors must be at the charge of insuring their own goods, should they desire this security. Every precaution will be taken to prevent fire, theft, or other losses, but the Commissioners will not be responsible for losses or damage of any kind.

44. Exhibitors may employ assistants to keep in order the articles they exhibit, or to explain them to visitors.

50. Articles once deposited in the building will not be permitted to be removed without written permission from the Commissioners.

55. The Commissioners will provide shafting, steam (not exceeding 30 lbs. per inch), or water at high pressure for machines in motion.

56. Persons who may wish to exhibit machinery in motion will be allowed to have it worked as far as practicable under their own superintendence and by their own men.

104. By arrangements made with the New Zealand Government, all foreign or colonial goods intended for exhibition, sent and addressed in accordance with the regulations laid down by her Majesty's collector of customs, will be admitted into the country and allowed to be transmitted to the exhibition building without being previously opened, and without payment of any duty. But all goods which shall not be re-exported at the termination of the exhibition, will be charged with the proper duties under the ordinary Customs' regulations.

106. Every article sent separately, and every package, must be legibly marked with the name of the country

or colony of which it is the produce or manufacture, and as far as practicable with the name of the exhibitor or exhibitors.

107. The following is the form of address which should be adopted:—

To the Commissioners for the New Zealand Exhibition, 1865.
BUILDING, DUNEDIN, OTAGO,
N. Z.
From [state country and exhibitor's name].

To prevent loss, miscarriage, or mislaying, articles or packing-cases containing them, which occupy less bulk than two cubic feet, should not be sent separately if it can be avoided, but packages under such size, containing as far as possible the same classes of articles, should be transmitted in combination.

The following outline of the Patent Law of New Zealand is inserted for the information of exhibitors from a distance, but it is not the intention of the Commissioners to take any steps in reference to the protection of inventors or discoverers by patent or registration:—Under the "Patents Act, 1860," any person, being the originator of any new invention or improvement, for which no patent has been issued in New Zealand or any other country, may obtain letters patent after depositing £10 with the Colonial Treasurer, and at the office a petition to the Governor, stating the object of his invention and praying for a patent. The specifications and drawings must be delivered in duplicate, with principle of machines, &c., explained, and specimens of ingredients, &c., if any, for purpose of experiment be delivered. Notice to be published in the *Gazette*, and one newspaper in each province, and after four months, if no objection is lodged, a patent may be issued; the holder to be entitled to the same privileges in New Zealand as patentee under the Great Seal in England. More than 12 persons may be interested in a patent. Patent may be assigned. The holder or assignee of letters patent obtained in Great Britain or other countries, may obtain letters of registration, entitling the holder during continuance of the original patent in the country in which it was granted, and no longer, to all the privileges of letters patent granted in New Zealand, on payment of £10 to the Colonial Treasurer.

110. No prizes will be awarded in Section IV. (Fine Arts).

Obituary.

The death of M. CHRISTOFLE was announced on the 16th of December, at the last meeting of the *Société d'Encouragement*, of Paris, by M. Dumas, the President, who took occasion to express the great loss the Society, as well as the commercial world of France, had sustained by the death of one who took foremost rank as a leader of industry in that Empire. All who visited the Exhibition of 1862 will remember the splendid display made by M. Christofle in that contest of nations, and how prominent a position articles sent by him held in adorning the French Court. Like our Elkington here, M. Christofle was the founder of the new industry of electro-metallurgy in France. Christofle, however, laid no claim to the title of inventor, or man of science, but he had thorough knowledge and appreciation of art; he commenced his career as an apprentice for three years, was afterwards a journeyman for one year, at the expiration of which he became a partner in the house Calmette. At the age of twenty-four he took the lead in the working of the precious metals, and obtained the gold medal at the Paris National Exhibition, in 1839, having been at the head of the above establishment ever since 1831. In 1834 he received the second gold medal for his display in the Exhibition of that year. He at a very early period saw the importance, in his trade, of the new art of electro-metallurgy, and at once bought at high prices the patents of Ruolz and of Elkington, at that time rival patentees. The history of Christofle is one of the most striking instances of perseverance and strong will. It required no small self-reliance to embark in a new and untried path of industry. His first payment to Ruolz, 500,000 francs to Elkington, second payment to Ruolz of 160,000 francs, and the necessary expenses involved in starting the industry, absorbed Christofle's whole fortune; he applied to his friends, who trusted him with 1,600,000 francs in addition, and thus he established a manufacture of enormous magnitude, in respect of which, before the expiration of the year 1844, he had received public recognition in the form of medals and the Cross of the Legion of Honour. But he did not achieve this position without a severe struggle, he was beset on all sides with pirates, who sought to rob him of the inventions he had so dearly purchased, and of the hard-earned fruits of his laborious exertions. He, however, succeeded in overcoming these adversaries, though at an enormous expense in litigation and otherwise. In 1847 the returns of the firm amounted to two million francs, and in 1859 they reached two million five hundred thousand. In 1851 he had again to defend his patents in the courts of law, and again he succeeded. From this period down to the day of his death his life was a long career of success, and he carried off medals of the highest grade at every exhibition, whether national, international, or provincial. The capital of the firm rose to three millions, and under the active superintendence of M. Ribes, whom he took into partnership, the capital exceeded six millions in 1859. In this year, in order to avoid certain Custom-house difficulties, he established an additional factory in Carlsruhe. He gathered around him an able staff of artists and skilled workmen, having in his employ upwards of 1,500 persons, and the firm is stated to have plated 5,600,000 pieces of plate, and to have used 33,600 kilogrammes of silver for the purpose, of the value of six million francs. This quantity of silver, if spread out in sheets the usual thickness of the plating, *i.e.*, at the rate of three grammes per square decimetre (forty-five grains per sixteen square inches) would cover a surface of 1,600 hectares (3,950 acres English).

Forthcoming Publications.

ELEMENTARY DRAWING COPY BOOKS, for the use of children from four years old and upwards in schools and families, compiled by a student certificated by the Science and Art Department as an art teacher, is announced for publication by Messrs. *Chapman and Hall*. These are prepared like copy books for writing. They fill seven books. Price 8d. each, or 3s. 6d. the set.

Notes.

ROYAL HORTICULTURAL SOCIETY.—For the encouragement of the study of scientific botany among all classes, the Royal Horticultural Society offers the following prizes for botanical collections:—1. One silver, and two bronze medals for the three best collections of wild plants of each separate county of the United Kingdom, dried, mounted on paper, folio demy size, classified according to the natural system, and labelled with the name of the locality where found, and the date when found. Intending competitors may obtain the forms of labels on sending twelve postage stamps to the Secretary of the Royal Horticultural Society, South Kensington. 2. Three gold medals will be given for the three best of all the collections out of all the several county collections. Not more than one of the medals can be awarded in one county. The names of the judges will be hereafter announced. The collection of plants must be arranged according to any natural method, and be accompanied by a list arranged

according to the same method with the species numbered. The collector to follow some work on British Botany, such as that of Babington, Hooker and Arnott, or Bentham, and to state the work which he adopts. The name of each plant, its habitat, and the date of collection to be stated upon a label affixed to the paper on which it is preserved. (The paper and label to be similar to the specimens which will be supplied, on sending twelve postage stamps, by the Secretary of the Horticultural Society to intending competitors.) The judges will not award the prize unless the selection is a fair representation of the plants to be found in the county in which they have been collected. In judging of the respective merits of the collections, attention will be paid not merely to the number of the species, but also to the condition and rarity of the specimens, and the mode in which the plants are dried and preserved. The collections must be delivered on or before 31st December, 1864, to the Secretary of the Royal Horticultural Society, South Kensington, carriage free, marked with a number or cypher, and accompanied with a sealed letter, containing the collector's name, the address, and the price at which the collection can be sold or another made. The sealed letter which accompanies each collection must contain a declaration, signed by the collector, in the following terms:—"The plants which accompany this note were collected by myself from the fields and woods within the limits of the county of   after the 1st of February, 1864." Further, a Society's gold medal will be awarded to every exhibitor of a new species of plant found growing in the United Kingdom.

THE BRONZE AND COPPER COINAGE.—It is stated that the old copper coin will be ere long declared an illegal tender, and that the Master of the Mint is particularly desirous to afford facilities for its return to the Mint previous to the issue of an official proclamation.

STEAM-BOILERS.—It is reported that M. Domslain, an officer in the imperial navy, has solved a problem of great importance in steam navigation—the substitution of fresh for salt water in the boilers, an invention likely greatly to increase their durability.

MEETINGS FOR THE ENSUING WEEK.

MON. ...Entomological, 7.
British Architects, 8.
Medical, 8½. Clinical discussion.
United Service Inst., 8½. Capt. E. G. Fishbourne, R.N., "Naval Ordnance."
Royal Inst. 2. General Monthly Meeting.

TUES. ...Civil Engineers, 8. Discussion upon Mr. Redman's paper on "The East Coast, between the Thames and the Wash Estuaries."
Pathological, 8.
Photographic, 8. Annual Meeting.
Anthropological, 8.
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Experimental Optics."

WED. ...Society of Arts, 8. Mons. E. Vial, "Instantaneous Engraving upon Metal," with experiments.
Geological, 8. 1. Sir R. I. Murchison, K.C.B., and Professor R. Harkness, F.R.S., "On the Permian Rocks of the North west of England, and their Extension into Scotland." 2. Mr. J. Wyatt, F.G.S., "On further Discoveries of Flint Implements and Fossil Mammalia."
Pharmaceutical, 8.
R. Society of Literature, 8½.

THUR. ...Royal, 8½.
Antiquaries, 8.
Chemical, 8. Dr. How, "On Mordenite."
R. Society Club, 6.
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Experimental Optics."
Linnæan, 8. 1. Mr. John Scott, "Observations on the Functions and Structure of the Reproductive Organs in the *Primulaceæ.*" 2. Mr. Walter Moxon, "Notes on some points in the Anatomy of *Rotatoria.*"

FRI.......R. United Service Inst., 3. Capt. F. E. B. Beaumont, R.E., "Balloon Reconnaissance."
Royal Inst., 8. Mr. J. A. Froude, "On the Science of History."
Philological, 8.
Archæological Inst., 4.

SAT. ...Royal Inst., 3. Mr. J. Lubbock, "On the Antiquity of Man."

Patents.

From Commissioners of Patents Journal, January 22nd.

GRANTS OF PROVISIONAL PROTECTION.

Bird cages—93—S. Robotham.
Boots, &c.—51—W. Pidding.
Brick-making machinery—2318—J. Farmer and C. Hadfield.
Brooches, &c., fastenings for—53—I. Lazarus.
Brushes—69—J. N. Garrod.
Carding engines, "cards" for—8—W. Allen and W. Johnson.
Carriages—3—J. W. Nottingham, W. H. P. Gore, and A. H. A Durant.
Collar—24—G. Speight.
Cotton scutching—3201—W. Noton.
Cotton spinning—2—J. Gee.
Fabrics—3259—N. Lloyd and E. Hargreaves.
Fire-arms, breech-loading—3308—A. Byrnes and H. Benjamin.
Fish, &c., paralyzing, &c.—2644—I. Baggs.
Footlights, &c.—22—C. Defries.
Furnaces—63—W. C. Beatson.
Furnaces—4—E. B. Wilson.
Gas, &c., generating—33—J. Kidd.
Gates, &c., fastening—2934—L. D'E. de Saint Jean.
Guns, mounting—3309—J. Radley.
Gymnastic apparatus—99—W., G., T., and A. Hanlon.
Hose coupling—75—W. E. Newton.
Lamps—97—M. A. Dietz.
Locks, &c.—28—J. B. Fenby.
Locks, &c.—57—P. Walters.
Looms—65—J. Webster.
Looms—3304—J. Starkey, J. Haworth, and J. K. Phippin.
Millboard, &c., cutting—79—D. Nickols.
Motive power, generating and applying—77—H. M. Nicholls.
Mules, self-acting—38—H. Nelson and J. Heap.
Optical illusions—3209—C. Bolton.
Ores, smelting—16—W. Balk.
Paper, &c., manufacture—23—A. L. Le Harivel.
Peat, &c.—30—J. J. Hays.
Piled fabrics—3306—J. Clegg.
Pneumatic apparatus—3295—L. E. Desestre.
Potatoes, &c., cleansing—91—J. Clay.
Presses, letter copying—6—W. Muir.
Propelling vessels—87—J. Wheatley.
Railway signals—32—C. W. Harrison.
Rifle targets—95—G. W. Hart.
Scarfs, &c., fastening for—3303—W. F. Brown.
Screws, cutting, &c.—21—M. Bayliss.
Seed sowing, &c.—2873—L. L. Sovereign.
Sewing machines—12—H. A. Bonneville.
Sewing machines—25—J. H. Johnson.
Sewing machines—42—J. Cumming.
Ships, trimming—3231—W. L. and T. Winans.
Show cases—26—R. Tomlinson.
Steam engines—59—W. Brookes.
Steel, &c., manufacture—3233—D. Adamson.
Street lamps, &c.—83—J. Browning.
Targets—55—J. F. Bland.
Umbrellas, &c.—40—J. I. and H. G. Tracey.
Wall-paper, colouring—3133—R. A. Brooman.
Window sashes—20—J. Askew.
Wool, &c., spinning—36—H. Blakey and J. Alderson.

PATENTS SEALED.

1861. J. W. Welch.	1892. W. and J. Graham.
1861. J. Whittaker.	1893. G. Sigl.
1871. A. Hector.	1928. E. A. Cowper.
1877. P. H. Girardin.	2752. R. Sellar.

From Commissioners of Patents Journal, January 26th.

PATENTS SEALED.

1681. C. Schiele.	1958. E. Morewood.
1882. E. Sturge.	1977. D. W. Barker.
1883. G. Inskeep.	2124. J. Shaw.
1886. J. T. Stephens & C. Hoare.	2214. J. Lillie and J. H. White.
1891. T. Apps.	2401. J. Mackay.
1908. R. E. Bibby.	2522. H. A. Bonneville.
1911. J. E. Vanner.	2926. H. A. Bonneville.
1922. S. Bury and J. Price.	3059. H. A. Bonneville.
1923. J. H. Walsh.	3103. W. H. Cole.
1957. T. W. Guillod.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

152. C. W. Lancaster, J. Brown, and J. Hughes.	205. A. F. Yarrow and J. B. Hilditch.
167. C. W. and F. Siemens.	216. H. Bessemer.
172. E. Ellis.	288. D. Walmsley & J. Rostron.
185. W. Wilson.	321. W. M. Storm.
198. J. Vero.	330. J. L. Jullion.
213. R. Mushet.	202. S. Needham.
176. A. E. Holmes.	206. C. Lungley.
175. J. Chatterton & W. Smith.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

167. T. Johnston.	221. H. Bessemer.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, FEBRUARY 5, 1864. [No. 585. Vol. XII.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at 8 o'clock.

Feb. 10.—"On Fresco Painting, as a suitable mode of Mural Decoration." By J. Beavington Atkinson, Esq.

Feb. 17.—"On Public and Private Dietaries," a sequel to the paper read on the 16th December last. By Dr. Edward Smith, F.R.S.

Feb. 24.—"On Petroleum, its Economic Value, with a Visit to the Petroleum Wells of Canada." By Dr. Marcet, F.R.S.

Cantor Lectures.

Courses of Lectures on the following subjects are arranged for the present Session:—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. Hastings, Esq., Barrister-at-Law (already delivered).

Fine Arts Applied to Industry. By W. Burges, Esq.

Chemistry Applied to the Arts. By Dr. F. Crace Calvert, F.R.S.

The following is a syllabus of Mr. Burges's Lectures, of which the first will be delivered on Monday next, the 8th inst.:—

Feb. 8.—Lecture I. Introductory:—What is an art manufacture? Advancing state of English manufactures in an art point of view. Much owing to Government Schools of Art. Impediments to further progress:—1. Want of a distinctive architecture in the 19th century fatal to art generally. 2. Want of a good costume fatal to colour. 3. Want of sufficient teaching of the figure fatal to art in detail.—Hints for the advancement of Art applied to Industry.—Design of following lectures:—1. To take one or two phases of some particular industry in past times. 2. To compare them with our own phase of the same industry. 3. To offer suggestions for our future improvement.

Feb. 15.—Lecture II.—*Glass.*—Antique glass, Venetian glass, modern glass (Powell, Chance, &c.); Mediæval stained glass; modern ditto; Mediæval enamels; modern ditto; (Legoste of Paris.)

Feb. 22.—Lecture III.—*Pottery.*—Etruscan vases (Wedgwood); Italian majolica (Minton); Sèvres china; modern biscuit.

Feb. 29.—Lecture IV.—*Iron and Brass.*—Antique bronzes; Mediæval ditto; modern French bronzes (Barbédienne); Mediæval dinanderie; modern ditto (Hardman, Hart, &c.); Mediæval and Renaissance wrought iron; modern ditto; cast iron.

Mar. 7.—Lecture V.—*Gold and Silver.*—Antique and Mediæval plate; modern ditto (Elkington); Antique and Mediæval jewellery; modern ditto; Antique and Mediæval coinage; modern ditto.

Mar. 14.—Lecture VI.—*Furniture.*—Mediæval furniture, oak and painted; Renaissance; 16th and 17th centuries; modern.

Mar. 21.—Lecture VII.—The Weaver's art; Mediæval, Eastern, modern.

The Lectures will begin on each evening at 8 o'clock.

Institutions.

The following Institutions have been taken into Union:—

Ashton and Dukinfield Mechanics' Institution.
Hoddesdon and Broxbourne Mutual Improvement Society.

The Christmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

CANTOR LECTURES.

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. Hastings, Esq.

Third Lecture, Monday, January 25th.—The Law of Contraband, and of Capture of Private Property at Sea.

Mr. Hastings, in commencing his third lecture, observed that in this course he touched but slightly on maritime law as between belligerents, inasmuch as he treated of the subject chiefly in connection with commerce, and belligerents, of course, had no trade with each other; he spoke of it principally as affecting neutrals. The lectures, too, were designed to illustrate principles, not to enter into the details and technicalities of the law. Now, one great principle involved in the subject was this, that the natural right of neutrals to trade was not in any way abolished by war; they had an undiminished right to trade with both belligerents; but they exercised that right subject to certain restrictions and inconveniencies which each belligerent might inflict under the sanction of international law. The belligerent power of blockade was one of these restrictions, and the law of contraband was another. International law recognised a right in any state that might be at war to prevent the supply to its antagonist of those articles which would enable him the better to continue the contest. In the origin of the law it became customary for a sovereign declaring war to publish a list of the articles which he forbade to be sent to the enemy's country; and hence the term *contraband*,

which means simply against the *ban*, or edict, thus published. It was to be observed that whereas blockade attached only to particular ports and specified lines of coast, the prohibition of all trade in contraband articles extended to all parts of the enemy's territory, whether blockaded or not; it was sufficient if the port of destination were hostile. It was also to be remembered that the character of contraband only attached when the goods were in transit to the belligerent; up to the moment of their shipment the trade in them was perfectly free; after that it was carried on at the risk of the trader. Mr. Hastings sketched the history of the law of contraband, from its origin (as far as England was concerned) in the reign of Elizabeth, and showed that the lists published in former times of contraband articles embraced a wider range than at present, the tendency of modern times being to diminish the restrictions on trade. English jurists, to the further relief of commerce, held that contraband was of two classes—absolute and conditional; the first being those articles which would be used in war only, such as guns, shot, powder, &c.; the second, those which might be used either for war or peace. The character of the latter was determined by the circumstances of the case; provisions, for instance, were *prima facie* pacific, but, if shipped for a besieged place, became contraband. The French writers, especially Hautefeuille, were inclined to restrict contraband to the actual munitions of war. The punishment inflicted by the belligerent on the neutral carrying contraband, was the forfeiture of the prohibited cargo, to which was added the loss of the ship if it belonged to the same owner, or if deception had been practised as to the voyage. The mode of applying the law was by the right of search, with which every belligerent power was armed, and which extended to vessels under every flag. Mr. Hastings observed that this brought him naturally to the second subject of his lecture, that of the capture of private property at sea. There were four predicaments in which a belligerent exercising the right of search might find merchantmen at sea—they might be:—1. Enemy's ship with enemy's cargo; 2. Neutral ship with neutral cargo; 3. Enemy's ship with neutral cargo; 4. Neutral ship with enemy's cargo. As to the first, it was clear they were fair prize under the present law as recognised by every nation. As to the second, it was equally clear they were free. On the third and fourth, the policy of France and England, up to 1856, had been different. France held the rule of "Enemy's ship, enemy's cargo;" *i.e.*, that a neutral cargo on board an enemy's ship was confiscable, as tainted with the character of the ship. England, on the contrary, considered the neutral cargo as free. On the other hand, the English rule condemned as good prize the enemy's cargo found in a neutral ship, while France, America, and generally the continental states, had struggled for the rule, "free ship, free goods," or that the neutral flag should cover the enemy's cargo. England held her own on this point against the two maritime confederations of 1780 and 1801, but abandoned the rule in 1856, when Lord Clarendon signed the Declaration of Paris; France, on her part, waiving her policy of "enemy's ship, enemy's goods." Both rules had been previously suspended during the war with Russia. England gained by this concession the abolition of privateering, but it became a question whether, under the present law, our mercantile flag would not vanish from the seas in the event of a naval war, as our traders would probably prefer to ship their goods in safety under a neutral flag. Mr. Hastings concluded with some observations on the evils of privateering.

Fourth Lecture, Monday, February 1st.—The Foreign Enlistment Act.

Mr. Hastings, after observing on the difficulty involved in dealing with subjects which formed current topics for public discussion, and concerning which partisan feeling was excited, and the peculiar application of this remark to the matter of his concluding lecture, went on to describe the provisions of the Foreign Enlistment Act, 59 Geo. III., cap. 69. It was, as the preamble showed, a municipal law, passed to preserve the peace and welfare of this kingdom; and while the first portion referred to the enlistment of foreign troops, the latter forbade the equipping and fitting-out of ships for the service of foreign powers without license from the Crown; but, though a municipal act, it dealt with international matters. Municipal law was not unfrequently compelled to interfere in order to carry out international obligations; as, for instance, in the statutes enforcing the extradition treaties. Above all, when the action of individual subjects threatened to clash with or subvert the policy of the corporate state, the legislator was bound to compel individuals to shape their conduct by the rule laid down, or obligation entered into, by the whole nation. The grand object of international law being to maintain peace and intercourse between states, it followed that any conduct tending to compromise peace, uch as fitting out expeditions on neutral territory:c assist a belligerent, or making such territory the starting-point for hostilities, must be rigidly prohibited by any government wishing to maintain the sanctity of public law. The operation of such a law as this Foreign Enlistment Act was wholly different from that of contraband. The law of contraband left trade free, but told the trader that he embarked on the forbidden traffic at his own peril, and without the protection of his flag; this act absolutely *prohibited* the conduct against which it was aimed,—a vital distinction. Mr. Hastings traced the history of the enactment, showing that it was borrowed from the American statute of 1794, passed at the instance of Washington, to prevent the equipment of French privateers in American ports, and brought before Parliament by Mr. Canning, when England found herself a neutral power in the war waged by Spain against her revolted colonies. The American Act had been honourably administered, and a number of cases had been decided upon it by the Courts of the United States; the last instance of its operation being in our favour during the Russian war. Mr. Hastings alluded to the escape of the *Alabama*, and the cases of the *Alexandra*, *Rappahannock*, and the steam rams. However lamentable the mischance respecting the *Alabama*, he thought too much blame had been cast on the English Government. A state, like an individual, could but do its best, and was blameless in that event whatever might occur; and history showed that such mischances were not confined to this country, since the American Act had also been evaded, as the records of American tribunals would show. Mr. Hastings concluded with a brief summary of the priciples he had endeavoured to elucidate in the course. He was aware how much his exposition of them had fallen short of their importance and interest, but he trusted, nevertheless, it had not been wholly unworthy of the objects of the foundation, or the dignity of the Society.

The Chairman (Mr. W. Hawes) said, before the meeting separated he desired to express the thanks of the Council and of the Society to Mr. Hastings, for the very able and very interesting course of lectures he had just concluded. He had also to express regret that they had not been more numerously attended, and that the very valuable information which had been brought before the members had not received that attention which the Council expected would have been given at the present time to so interesting a subject. Still, as this was the first time the Society had given its members an opportunity of receiving instruction by means of lectures delivered by gentlemen distinguished for their knowledge in those branches of science to which these lectures had been devoted, the Council could not but hope that when their value was more universally known and appreciated, the attendance would be commensurate with the importance of these lectures, and the ability with which they had been delivered.

Eighth Ordinary Meeting.

Wednesday, February 3rd, 1864; Lord Henry G. Lennox, M.P., Vice-President of the Society, in the chair.

The following candidates were proposed for election as members of the Society:—

Bevan, Alfred, 11, Bryanston-square, W.
Bird, Thomas, 106, King-street, Manchester.
Busk, William, 28, Bessborough-gardens, Pimlico, S.W.
Greig, Robert R., 4, Verulam-buildings, Gray's-inn, W.C.
Henchy, Capt. Robert Cameron, Junior United Service Club, S.W.
Nunn, Richard M., Grays, Essex.

The following candidates were balloted for and duly elected members of the Society:—

Appleby, T. H., 30, Gracechurch-street, E.C.
Ashton, Thomas, J.P., Portland-street, Manchester.
Bartley, George C. T., South Kensington Museum, S.W.
Beauclerc, Capt. George, 23a, Grosvenor-street West, W.
Bickford, J. J., Tuckingmill, Cornwall.
Butler, James Robert, 4, Elm-street, Gray's-inn-road, W.C.
Cargill, William Walter, M.P., 4, Connaught-place West, W.
Cole, Alan Summerly, South Kensington Museum, S.W.
Cole, Lieut. Henry Hardy, R.E., Brompton Barracks, Chatham.
Corbould, Edward Henry, 10, Hyde-park-gate South, W.
Cross, William S., Park-street, Richmond, S.W.
Davies, John, 166, Queen-street, Portsea.
Del Rio, Patricio M., 130, Jermyn-street, St. James's, S.W.
Edwards, Rev. Allen T., M.A., 5, Kennington-terrace, S.
Fisher, George, The Woodlands, near Cardiff.
FitzGerald, Lord Otho, 8, Carlton-house-terrace, S.W.
Howell, George, 693, Old Kent-road, S.E.
Lawrence, Hugh M., Atlas Works, Manchester.
Lloyd, James Richard, Shrubbery, Belmont-hill, Lee, S.E.
Mackinlay, D., 42, Clarges-street, Piccadilly, W.
Martin, Louis Emile Constant, Chateau Boujeon, Rue Balzac, Paris; and 32, Albion-street, Hyde-park, W.
Masters, M., 1, Paragon-place, New Kent-road, S.E.
Moser, John, 165, High-street, Southwark, S.
Owen, Philip Cunliffe, South Kensington Museum, S.W.
Oxland, Robert, F.C.S., Empire City, Nevada Territory, America.
Rodgers, Rev. John, 17, Mecklenburgh-square, W.C.
Sale, Colonel Thomas Henry, 27, Westbourne-park, W.
Sturgeon, John, Pease's-buildings, Leeds.
Thicke, Charles James, 17 and 18, New Bridge-street, Blackfriars, E.C., and Rosendale, Dulwich, S.E.
Walker, Mowbray, Millwall Iron Works, E.
Wolff, Lewis, 15, Albert-square, Clapham, S.

The Paper read was—

ON A METHOD OF INSTANTANEOUS ENGRAVING ON METAL.

By Monsieur E. Vial, of Paris.

A great number of processes have been at various times proposed as substitutes both for engraving in relief upon wood and also as aids to plate engraving. The ordinary process of engraving upon wood, as well as the plate engraving, requires long and costly work; and both processes are merely reproductions of the drawings of artists, the difficult intepretation of whose ideas is a constant stumbling block to the engraver, whilst the final result obtained is always more or less a combination of the ideas of the artist and those of the engraver.

To engrave a drawing directly upon the plate without the intervention or (so to speak) the interpretation of the engraver, is, then, of unquestionable utility, both for the purposes of relief and intaglio engraving. In the numerous trials which have been made upon this subject in order to obtain the necessary depth in the engraving, recourse has almost always been had to acids, or to voltaic electricity, but it is evident that with this method of operating the metal is acted upon, at the same time, both in a lateral and a vertical direction, and hence the result has been more or less imperfect and unsatisfactory.

The new processes which I have the honour to submit to the Society of Arts this evening are based (excepting the first) upon electro-chemical phenomena, without the aid of an ordinary galvanic battery, the effect of which is a clean, deep, and non-lateral biting. They have been protected by letters patent in this country and in France, and form the subject of a paper which I presented on the 15th of March, 1863, to the Imperial Institute of France, a commission appointed by which has reported favourably on my communication and conveyed to me the thanks of the Institute for it.

I will now briefly describe the fundamental principles of my processes, together with the different manipulations and the industrial applications which result therefrom.

I may state firstly, that the principle of my discovery is but the application of a scientific fact long since known, which is, that if we plunge a piece of one kind of metal (say steel, for instance) into a saline solution of a metal of an opposite nature (such as copper), the solution is immediately decomposed, and the metal reduced is precipitated upon the former, frequently with a considerable amount of adhesion. Such is my starting point, and without taking upon myself the scientific explanation of the phenomena, I shall confine myself merely to the description thereof.

The first process which I shall describe depends—

1st. Upon metallic precipitations.

2nd. Upon the relative affinity of acids for different metals.

It consists, firstly, of making a drawing upon paper with a metallic ink, composed, for example, of a solution of sulphate of copper; and I may add, *en passant*, that a solution of the salt of any other metal, such as lead, bismuth, mercury, silver, &c., would produce the same effect, according to the metal desired to be engraved. When the drawing has been thus made it is placed, face downwards, upon a plate of zinc or steel, and next covered at the back with a piece of cloth slightly damped, and the whole is then submitted to a uniform pressure. About two minutes afterwards the design will be found transferred entirely, and with the greatest faithfulness, on to the metal plate, without any alteration or deterioration whatever of the original drawing. If instead of making the drawing upon paper, it is made more simply still, upon the metal itself (whether zinc or steel), with this metallic ink, the same phenomena are produced. In this state, in either the one case or the other, the design appears on the surface of the plate in slight relief formed by the deposit of copper, a solid and resisting body.

But in order to obtain a sufficient degree of relief for printing purposes, and more especially for surface printing, it is necessary to employ corrosion by acids or voltaic electricity, and this constitutes the second phase of the process. In fact the acids, having a less degree of affinity for the copper than for the zinc, immediately attack the latter, whilst the former serves as a kind of protecting varnish to the lines.

I regard this process more from a scientific than an industrial point of view, for, having been very much occupied with carrying out my other processes, I have been forced to neglect this one; but I may add that it appears to me particularly applicable to the engraving of lace and other fabrics, which would only require to be impregnated with a solution of copper, to be transferred to the zinc, and then be engraved in relief.

I now come to my second process, or reproduction of old engravings. I employ two methods; the first, which I will call Process A, depends—

Firstly, Upon the antipathy of water for fatty bodies.

Secondly, As the preceding, upon the metallic precipitations, and the affinities of acids.

In fact ordinary printing ink is greasy, and water, instead of having any attraction for it, is, on the contrary, repelled.

If, then, we place an engraving so as to float evenly with its back or wrong side upon a metallic solution, the aqueous liquid penetrates the paper slowly by imbibition, only around or between the lines formed of the greasy ink. After removing the proof from the bath, it is wiped lightly and placed with its face upon a plate of zinc, and a uniform pressure applied. The metallic salt of the solution is immediately decomposed, reduced, and precipitated on to the plate, which it covers all over with its metal (excepting where the lines of greasy ink occur) in such a manner as to give a negative image in relief representing with the greatest exactitude the design or engraving which has served to produce it. A few moments are sufficient to produce this result; even photography does not operate with more promptitude and fidelity. Negative proofs may at once be taken from the plate by the ordinary printing process, which proofs, by repeating the process, will produce positive plates of zinc. Or the positive plates may be made by at once attacking the zinc, covered with the negative image, by means of a voltaic battery, or in a bath containing 10 per cent. of nitric acid. The metallic solutions which I at first employed upon zinc were formed with salts of lead, copper, or bismuth, but the chloride of gold has latterly yielded me the best results; this is readily explained, on the one hand, by the facility of reduction which the salts of gold possess, and on the other hand by the resistance which this metal offers to the attack of the acids. The solution is composed of about 2 parts of chloride of gold to 100 parts of distilled water.

This first method possesses the great advantage that it does not injure the original proof, which may thus be used an almost indefinite number of times, all that is necessary to remove the metal which is reduced on its surface being to plunge it first into acidulated water, which dissolves the metal, and then into ordinary water, which removes all traces of the acid.

Guided by analogy, I have proceeded from these experiments to others, and it may not be without interest to speak of some of them and to add that engravings may be transferred on to metals by impregnating them with alkaline solutions of chlorides, sulphurets, bromides, and iodides, and then applying them, as above, on plates of pure or silvered copper, which will then present, according to the heat to which they are submitted in drying them, images in iridiscent colours of a very beautiful effect, with a slight relief caused, when operating upon plates silvered by means of mercury, by the volatilization of the latter metal by the heat.

This process of the reproduction of proofs by imbibition may be extended still further, and applied to engraving upon glass, and to printing woven fabrics. In the first case it suffices to impregnate the back of the engraving with hydrofluoric acid, and to apply it with its face upon the sheets of glass, which at once become dulled and then engraved by the corrosive influence of the acid. In the second case, I propose to employ the chemical phenomena known by the name of double decompositions, and the following is the method of operating: The engraving is to be impregnated, as above, with pyrogallic acid, or with a mordant capable of re-acting upon a fabric previously impregnated with sulphate of iron, or otherwise suitably dyed, and then applied with a uniform pressure upon the stuff. The engraving may in this way be transferred to the fabric in a few minutes.

The phenomena are very simple; the pyrogallic acid transforms the sulphate of iron on the fabric, into black pyrogallate of iron, and the mordant decolorizes or fixes the dye of the fabric in all the white parts of the proof. The number of impressions which may thus be obtained is almost unlimited; the original engraving, after being washed, will serve as many times as may be desired.

My second method of reproducing old engravings, and which I will designate as Process B, has for its objects, firstly, the transfer of the engraving, and, secondly, the engraving of the transfer, and depends—

1stly. Upon the transfer.

2ndly. Upon the phenomena of electro-chemistry.

The transferring of old engravings presents many difficulties, in fact, when a proof has been kept several years, the fatty body of the ink is completely resinified, and forms with the carbon an almost impenetrable mass, presenting a very great obstacle to the revival of the ink. If the ink employed is too liquid the paper absorbs, little by little, all the greasy matter thereof, and thus another difficulty is encountered. On the other hand, the nature of the paper, its texture, porosity, and thickness, and the sizing which it has or has not undergone, are so many obstacles which have to be overcome.

After numerous experiments I have at length been enabled to surmount these difficulties almost completely by applying to the surface of the proof a preparation of petroleum or turpentine; the ink soon becomes impregnated therewith, and when the proof (slightly dried between two sheets of bibulous paper) is passed under the press in contact with a steel plate, this preparation, having a greater attraction for the plate than for the paper, soon becomes detached from the latter, carrying with it a small portion of the black of the ink.

I am perfectly convinced of the success of these transfers, but in order not to compromise the safety of bank-notes, drafts, &c., which can be faithfully transferred by this process, I shall not enter into the details of this manipulation, but pass on to the method of engraving such transfers.

All that is necessary to effect this is to plunge the plate into a bath composed of a saturated solution of sulphate of copper containing a small quantity of nitric acid, when the copper is immediately precipitated upon the plate in all its metallic brilliancy leaving, however, the lines intact, so that the copper then serves as a varnish to resist the acid, whilst the steel, having a greater affinity than the copper for the acid, is corroded or "bitten in" thereby, under or through the lines, by the phenomena of electro-chemistry. The problem may be summed up in two words, viz., *coating* and *biting* at the same time.

The effect produced may be described as follows:—When the steel plate (with the drawing or transfer in greasy ink on its surface) is plunged into the acid solution of sulphate of copper, those parts of the surface which have not received any portion of the ink are immediately coated with metallic copper. The solution penetrates at the same time by imbibition through the greasy matter of the ink and reaches the metal beneath, when a voltaic pair (copper and steel) is immediately constituted, the copper already deposited forming the negative pole, and the steel, not yet attacked, being the positive pole. An electro-chemical decomposition of the sulphate of copper then takes place, and at the same time the steel is attacked by the sulphuric and nitric acids. The operation proceeds tranquilly, without any effervescence or disengagement of gas; no other kind of "biting-in" takes place so calmly. About ten minutes afterwards, the steel plate is withdrawn from the bath, perfectly engraved, and nothing further is required but to remove the copper from the surface by means of ammonia, to render it fit for printing from by the ordinary plate printing process.

One of the most remarkable effects of this process is that all the gradations of an engraving from the highest lights to the deepest shades, are produced at one simple operation, without any artificial "stopping out" whatever; the length of time each part is under the action of the acid being always exactly proportioned to the thickness of the layer of ink at that particular part. For example, when the plate is first placed in the bath the copper instantly covers and protects from the acid the exposed surface, *i.e.*, the white parts of the engraving; the

acid next attacks the finest lines, or those parts where the thinnest coating of ink exists, and by the time these lines have been engraved to a sufficient depth, the copper spreading laterally from the edges will have entirely covered and "stopped out" these portions, whilst the broader and deeper lines will resist the deposit of copper (and hence remain exposed to the action of the acid) for a longer time; and so on to the deepest shades, which will remain still longer exposed to the action of the acid, whilst all the lighter parts of the engraving are effectually protected by the copper deposited, so that in fact, each line will be infallibly engraved to a greater or less depth in exact proportion to the thickness of its layer of ink, which is precisely the effect desired. This same phenomenon also prevents the possibility of lateral corrosion, and, on the contrary, causes each line to narrow as it deepens, and to assume as near as possible, the V-shaped form produced by the cut of the angular point of the graver.

Third Process. The method above described, of acting upon steel plates by sulphate of copper, naturally led me still further, and thus I arrived at my third process, which is merely an extension of the preceding method.

It consists in making an autographic, lithographic, or other transfer on to the steel plate, not by a preparation of turpentine, but by a greasy ink only, or in making a heliographic or photographic drawing or transfer on the same by means of bitumen of Judœa or alkaline bichromates, or in drawing on the steel direct with indian ink, chalk, or black lead pencil; or painting thereon in oil or pastel, or drawing in perchloride of iron or acid; in a word, making a transfer or direct drawing upon the steel plate, with any body or medium capable of resisting the deposit of copper, without opposing the attack of the acid, or with any body capable of depolishing the steel in parts which will be engraved when the plate is submitted to the action of an acid bath of sulphate of copper.

I may thus generalize my method and extend my particular process of biting on steel to an entirely new kind of engraving, destined, I believe, to take an important rank in this art as a rival to the aquafortis and lithographic processes.

The process is remarkable from the circumstances under which it takes place, and surprising from the results which it yields; for to attack the greasy body, which until now has been a protection to the steel, and to leave the polished surface intact is exactly the counterpart of any process hitherto known. To preserve to each artist his own peculiar touch and feeling; in a word, to perpetuate his individuality; this is to arrive at the object so earnestly sought, viz., translation without the aid if an interpreter, or, in other words, engraving without the assistance of the engraver.

This process has the two attractions of novelty and simplicity; it does not require practice, and I may add that it surpasses all other processes in the rapidity and fidelity of its execution. Its importance for engraving geographical maps and topographical plans is very great, if we consider that an engraving upon stone (which rivals copper plate in fineness) can be transferred readily on to steel by these means; we then have an economy equal to one-third in time and one-third in expense. The plates are almost inexhaustible, the printing always the same, and much superior to lithographic transfers, which always deteriorate by printing, and at the same time a heavy, cumbrous, and fragile material is also done away with. It may be applied to engraving arms for warlike or sporting purposes, and cutlery, for the reproduction of copper or steel plates, to lithographic engravings, or the transfer of lithographic engravings on to steel, and to the engraving of photographic proofs or transfers, whether obtained by means of bitumen of Judœa or alkaline bichromates, and to a variety of other useful purposes where rapid, faithful, and economical engraving is required.

In their report to the Imperial Institute of France, the commission say:—

"M. Vial has presented to the academy a memorandum, entitled "Researches on metallic precipitations, or essay on the reproduction of old engravings, preceded and followed by new processes of engraving"—which work has been referred for examination to a commission composed of Messrs. Dumas, Regnault, and Becquerel (reporter).

"Although these processes have been patented, your commission has thought that as one of these processes is founded upon an electro-chemical property which your commissioners believe to be unknown, it is their duty to inform the academy thereof without pronouncing on the artistic merit of the process, of which they are not competent judges.

"The following is the description of the process:—An engraving or drawing in greasy ink is transferred on to steel, or a drawing is made on the plate in the same ink. The plate is plunged into a bath of a solution saturated with sulphate of copper, to which is added a small quantity of nitric acid: five minutes after the plate is withdrawn and washed, the copper deposited is removed with ammonia, and the engraving is finished; the lines of the drawing are in intaglio. In the ordinary processes of engraving on metal, the fatty bodies which form the design preserve this metal, in the parts which they cover, from the corrosive action of the chemical agents; thus the engraving is obtained in relief. With that of M. Vial, the engraving is immediately obtained in intaglio. A similar effect takes place in drawing in chalk, blacklead pencil, or pastel, or on allowing points of rust to form on the steel.

"It is scarcely possible to imagine a more simple process of engraving. Let us endeavour to explain the effects produced. When a plate of steel, on which is a drawing in greasy ink, is plunged into a saturated solution of sulphate of copper containing a small quantity of nitric acid, that part of the surface which has not received the greasy ink is immediately coated with metallic copper, the particles of which have little adhesion between themselves, in consequence of the combined actions of the sulphate of copper and the nitric acid upon the steel. The solution penetrates at the same time, little by little, through the fatty matter by imbibition, and reaches the metal by the time that the voltaic pair, copper and steel, is constituted: the copper already deposited is the negative pole, the steel not yet attacked is the positive pole. The decomposition of the sulphate of copper then becomes electro-chemical; the steel is attacked by the sulphuric and nitric acids to a depth proportionate to the thickness of the layer of ink; the copper which proceeds from the decomposition is precipitated on the edges, and eventually raises the ink up in such a manner as to form a design in relief in copper, which is then dissolved by ammonia. The effects produced have this remarkable feature, that the gradation of the hollows represents exactly that of the tints of the drawing, so that the engraving is a faithful representation thereof. Your commission are assured, and are satisfied, that the process of M. Vial when proved by competent artists, has appeared to them well worthy of attention in relation to art.

"It is not without interest to remark that the lightest lines in the ink, which are the first penetrated by the solution, are those upon which the action has least energy, and where it ceases soon after, when the copper deposited on the edges spreads itself in such a manner as to cover over the points attacked. In a word, the action is slower to take place, and the effects are deeper, in proportion as the layer of ink is thicker. It is in these effects that the efficiency of M. Vial's process of engraving consists, the importance of which the Academy can appreciate, on viewing the proofs of a certain number of engraved plates, several of which have been engraved in the presence of your commission, and which have been deposited at the office.

"Your commission proposes to you, consequently, to thank M. Vial for his communication, and to give their approbation to the application to engraving on steel, which

he has made, of a property the effects of which have been hitherto unobserved, and which is capable of rendering useful services to the arts."

The conclusions of this report have been approved by the academy.

Since writing the above I have succeeded in transferring some old prints, both of engravings and letter-press, on to stone in the most perfect manner, by my process. Some proofs of the letter-press will be shown to the society, and also the stone with the transfer of the engraving thereon.

DISCUSSION.

Mr. GEORGE WALLIS said he could not but take exception to the term "instantaneous" as applied to this process. In the first place, because they had had to wait ten minutes while the plate was being prepared; and secondly, because he had the honour last session of bringing a process before this Society which effected the engraving of a plate in a few seconds instead of several minutes. He would, however, at once say he believed the process now brought before them was of an exceedingly valuable character, and in many respects calculated to be of great use in the arts. The fact that the artist could make his own drawing on the plate, so that the touch and spirit of the original should be reproduced in the engraving; was in itself a most important advantage. This was one of the merits, as he conceived, of the process he had had the honour of bringing before them last session, and he still prided himself upon that process as one possessing many special advantages and conveniences of its own, though he saw no reason to feel any jealousy of the one they had just heard described. If a photograph could be first transferred to stone and then the photo-lithograph transferred by this process on to a steel plate, a great advantage in an increased power of multiplying proofs was obtained, inasmuch as the lithographic stone became deteriorated in working in a far greater degree than the steel plate. He thought, however, from the specimens he had seen, that this process did not, in some respects, quite come up to that of which he claimed to be the inventor, inasmuch as by his plan the broader tints were more readily reproduced. In illustration of his process, it would be remembered that a drawing was made in the room with a brush; it was taken from the table and placed in a small machine, and in two or three seconds a plate was produced, which was immediately printed from. He thought, in point of refinement, the process of M. Vial was superior to his own, as well as in its power to throw off a large number of impressions, and therefore he hoped to see it fully and properly developed. He hoped those interested in such subjects would take this process up in a friendly spirit, and try it. The difficulty which inventors met with at the outset was to get people to try anything new. The cry was continually for something new, and when it was produced the remark was, "Oh, it is not like what we had before." This was especially the case in inventions applicable to the fine arts, though it was also the case with respect to manufactures.

Dr. BACHHOFFNER inquired whether the surface of the steel plate was not granulated in some degree in the first instance when placed in the bath, inasmuch as there must be an equivalent of iron dissolved for every equivalent of copper precipitated.

Mr. DAVIES (who attended to explain the process on behalf of M. Vial) replied that the surface of the steel plate remained as polished as before, and was not in the least degree granulated. The polished surface of the steel plate was instantaneously protected by the slight coating of copper deposited upon it the moment it was placed in the bath.

The SECRETARY observed, that no doubt what Dr. Bachhoffner stated must be chemically true. There must be an infinitesimal portion of the iron dissolved before the precipitation of copper took place, but he understood that practically that was so small as not to destroy the polish upon the steel plate, the proof of which was that when it was printed from the whites showed no granulation.

Dr. BACHHOFFNER remarked that the biting into the metal must evidently be only to a very slight depth. He would, therefore, ask whether any calculation had been made as to the number of impressions that could be taken from one plate, because in the case of an ordinary engraved steel plate it would afford a vast number of impressions. In this case the very small depth to which the plate was bitten in by the chemical action, led him to imagine that not many fine impressions could be taken, even with the most successfully engraved plates.

Mr. DAVIES replied, that M. Vial had communicated to him that he had never taken more than 750 prints from the same plate.

Dr. BACHHOFFNER said that number was satisfactory, considering the facility with which the engraving could be reproduced, although, as compared with an ordinary steel plate, it was a very small number of impressions.

Mr. HENSMAN said, that from the specimens he had seen he could but think that this process was one well worthy of attention.

Mr. GEORGE CRUIKSHANK, responding to the invitation of the Chairman, said, from what he had been able to see of this process, and judging from the specimens exhibited, he considered it a very valuable addition to the means of reproducing works of art. In a commercial point of view it was also worth consideration, for although it had been stated that only 750 impressions could be calculated upon from one plate, yet from the rapidity with which the plate could be reproduced, all practical difficulty in this respect was removed, for the number of impressions was thus practically unlimited. Some of the specimens exhibited were exceedingly well executed, and he should be much delighted to be allowed to make some experiments with this process himself. At the same time he did not believe it would ever completely supersede the etching tool; for instance, such small faces as he put into some of his illustrations, he did not think could be produced by any other instrument than the etching point. The fact was, however, that an artist who had the power of design did not often care to bestow much time upon mechanical labour, and therefore such a process as this would be valuable to him. It had been his misfortune, perhaps, in early life to spend a great deal of his time in the manual operation of etching. He had the power of designing as fast as he could think, but it had been his fate to employ many years in mechanical operations. For his own part he should never attempt to follow this process out with the idea of entirely superseding mechanical engraving, though, as he had already said, it would doubtless be valuable for many purposes. He was at the present time employed in preparing an engraving of his own picture of "The Worship of Bacchus," and, in order to preserve the character of the figures, he drew them himself in outline, and left it to others to fill in the details and shadows. With reference to this process he saw many advantages in it, and he believed, if introduced into this country, it would be largely and successfully employed for a great variety of purposes. The designer, in making a drawing upon wood, put in the shadows with a dash of the brush, and left it to the mechanical skill of the wood-engraver to produce those shadows in lines. It was the same with mezzotint and other engravings. He repeated his opinion, that while this process of engraving would never entirely supersede the etching tool, it was, nevertheless, a most valuable addition to the means of reproducing works of art.

Mr. JOUBERT said the process which had been described to them this evening, and exemplified, as far as it went, by the proof just printed, appeared to him to be a very interesting one, and to be entitled to attention as presenting several novel features. Whether it was capable of further development, so as to produce results in advance of what they had yet seen, time alone would show. One

characteristic feature of this process was that it acted upon an entirely opposite principle to that generally employed. There was one thing in the details of this process which appeared to him very extraordinary, and that was that (as stated by the inventor) the lines of the engraving were formed of a V-shape, similar to a line cut with the graver, although it was known that the effect of acids upon metal was to bite in horizontally as well as vertically. If that were the case it was very remarkable, because it was an example of effects produced by acids which had never been obtained before. He had himself been for many years practically engaged in engraving, and he had always found that the great difficulty in any chemical process hitherto applied, either on copper or steel, had been to prevent the acid running under the lines and widening them at the bottom. This process, however, appeared to effect what they had been trying to obtain ever since the art of engraving was invented. Some of the specimens exhibited presented features and qualities which had never been produced by any previous process; he alluded to the peculiar sharpness of the lines displayed in the small architectural drawing exhibited, which were so distinct that they were almost equal to lines cut with the graver. The faint impression from the plate produced this evening, he attributed only to the insufficient time of exposure to the action of the acids. If this process could accomplish what they saw in these specimens, it was very valuable, and they were much indebted to the inventor for having brought it before them. It, however, did not appear to accomplish one thing, which was a desideratum in there production of photographs, viz., the half-tone. Hitherto all previous processes had stopped at that point, and in this respect, although it was somewhat in advance of anything he had yet seen, it was not altogether successful. What they wanted was to reproduce the half-tone of photographs so that the pictures might be printed from a metal plate. As yet the intervention of photo-lithography was still required, and photo-lithographs were always imperfect in this respect. He hoped the inventor would be able to carry his process on so as to arrive at the result of producing a plate direct from a photograph. If he succeeded in doing that, he would indeed accomplish a great work, but for what he had already done he well deserved the thanks of all lovers of art.

Dr. Bachhoffner said without depreciating the importance of the invention, it reminded him of similar results obtained by Mr. W. R. Grove. In the preparation of the ordinary daguerreotype the surface of the plate was covered with a thin film of gold, and Mr. Grove made the coating of gold on the plate serve as an etching ground, and by the action of nitric acid the design was bitten into the plate, but the process was of slower application than that which had been illustrated this evening, and although proofs had been taken from the plate, the depth of the etching was so slight that it was of no commercial value. The statement made with regard to the V-shaped line produced by M. Vial's process seemed to involve a deviation from natural laws, for it was plain that acid solutions, whether acting directly or by double decomposition, would corrode the metal in a lateral as well as a downward direction. If it could be shown by microscopic observation that in this process there was an absence of lateral bite, it was the most important invention that had been brought forward for many years. That, he thought, still remained to be proved. He had no doubt, for certain classes of engraving, the process was of great value, but the question he had raised in the first instance still remained in his mind, namely, the granulation of the steel, for he observed in some specimens that the whites were not perfectly clear, and this showed that the surface of the steel was slightly acted upon. If it was the case that the plate, before being printed from, required polishing or burnishing, it might deteriorate the fine lines of the engraving. With regard to the number of impressions which one of these plates would yield, an ordinary engraved steel plate would produce many thousands, whereas one of these plates would only produce a few hundreds, and, before another could be produced, the intervention of the artist would be again required, unless the electrotype process was resorted to.

Mr. Cruikshank had understood that the original drawing might be preserved and reproduced on fresh plates as often as was required. As to the V-shape of the lines in the plates, that was a most interesting fact to those who had never seen anything of the kind before. He would ask whether the original drawing could be preserved, so as to reproduce the plates continually?

Mr. Davies replied that he did not think it possible to use the original drawing again, but an impression from the plate would give as many duplicate plates as were required. Upon the question whether the lines were narrower at the bottom than at the top, and as to the lateral biting of the acids, a microscopic examination of the lines would settle the question.

Mr. Lock referred to a process of reproduction of engravings brought out about the year 1845, illustrations of which accompanied one of the numbers of the *Art Union Journal* of the time. Since that time he had heard nothing more of the process.*

Mr. Joubert said the process just alluded to was this—The plate and engraving to be reproduced were prepared with a certain solution, which caused the engraving to adhere to the steel plate, the engraved portion being face to face with the plate. This being done, the paper was removed from the back of the engraving, leaving the ink adhering to the steel plate. A certain varnish was then spread over the plate, which adhered to it only in those parts not covered with the ink. The plate was then washed in a certain bath, and the varnish adhered, while the ink was removed. The plate was then treated with acids, but the result, he believed, was very imperfect, owing to the lateral biting. To produce anything like the original, the plate, after the above treatment, required to go into the hands of the engraver, and be almost engraved over again.

Mr. Dickes said that, in reference to the V-shaped corrosion of lines in the steel by acid, referred to by a previous speaker, we need not be incredulous, as if a new law respecting the action of acids had been alleged to have been discovered. In the process before the meeting there was no new law—there was simply a taking advantage of two well-known facts—one relating to the action of acids, the other to the deposit of copper. When copper was deposited it was not only thickened, but slightly increased at the edge; this increase would trench upon and narrow the line in course of biting by the acid, and would counteract widening or under-biting — the combined action resulting in a line narrower at the base than at the surface, in fact V-or shallow U-shaped. Our best thanks were certainly due to our foreign visitor for his clear, practical, and interesting paper, and we must heartily wish for him the reward his thought and industry had deserved.

Mr. Hensman suggested that practical proof as to the V-shape of the lines might be obtained by allowing a plate to remain in the bath, so as to be bitten far too deeply for

* This invention is described in the *Art Union Journal* for 1st January, 1845, which number contained a copy of a line engraving by Blanchard, after a painting by Delaroche. The editor of that journal states that from the plate produced by the inventor (in fourteen days from his having been supplied with an impression of the original engraving, the plate of which the inventor had never seen) he had had taken between 4,000 and 5,000 impressions, and that he had no doubt it was capable of yielding twice that number. Several engravers, to whom the copy and original were shown, declared they were so thoroughly alike that any one might suppose the two to be from the same plate. The editor further remarks that the original print was returned uninjured. He also states that he had seen a plate prepared from a drawing in little more than a quarter of an hour.

use; this would make the form of the lines quite evident, and capable of examination.

Mr. WENTWORTH SCOTT suggested that a distribution of plates should be made amongst such members as were willing to make microscopic examinations, and the results might be announced in the Society's *Journal*.

The CHAIRMAN said the pleasing duty now devolved upon him of proposing a vote of thanks to a distinguished foreign gentlemen who had come over to this country himself for the purpose of presenting before them his very interesting and ingenious process of engraving. All the speakers had agreed in saying that the invention was a very valuable one. The specimens exhibited were certainly very admirable, and though the illustration which had been produced in the room was not equal to former efforts, that, in fairness, might be accounted for by the hasty manner in which the experiment was conducted, from a desire not to keep the audience waiting. This process had been honoured with the recognition and thanks of the Imperial Institute of France, but Art was of no country, and, as Mr. Wallis had so justly said, there was no feeling of jealousy on our part that such a process should have emanated from a foreigner. He was sure he spoke the feeling of the meeting when he said they cordially welcomed this French invasion of Art, and he was confident they would cordially respond when he asked them to accord their thanks to M. Vial for his highly valuable and most interesting paper.

The vote of thanks was then passed.

The process described in the paper was practically illustrated by M. Vial himself, who produced a steel plate on which a drawing had been made, immersed it in the bath, and at the end of a few minutes took impressions from it. These, however, had not quite sufficient depth, owing to the plate having remained too short a time in the bath. A number of prints from plates on which drawings had been made by Gavarni and other leading French artists, as well as transfers from engravings, were also shown, and appeared to be generally very much admired.

The Secretary announced that on Monday evening next, at 8 o'clock, Mr. Burges would commence his course of seven lectures "On Art applied to Industry;" and that at the meeting on Wednesday evening next, a paper by Mr. J. Beavington Atkinson, "On Fresco-painting as a suitable mode of Mural Decoration," would be read.

The following letter has been received:—

SIR,—Having arrived late, and only heard part of the discussion on Monsieur Vial's paper, I can but state my opinion of the process from a conversation with the inventor, and an examination of the specimens. I must bear testimony to the great beauty of several of them, the process, like that of Mr. Wallis, being one that renders with much truth the touch of the artist, and as such gives the true spirit, so rarely rendered when the aid of the engraver intervenes. I do not think that it will supersede the burin or the etching needle, though it is capable of things they cannot produce, but in a lesser degree, it being at present an untested process, for the inventor informed me that it has not been applied to the purpose of book illustration—the wear and tear of numbers—the point at which most inventions of this sort break down. Isolated specimens, of great beauty, may be obtained, but the great test is wear; and though I believe M. Vial's process will give a greater number of durable impressions than that stated by his agent, I think, from the nature of the incision, that number cannot be very great, for, instead of the cut being like that of the burin, V-shaped, it is somewhat as a shallow U, without the undercutting effected by the acid. Of course, a great deal depends on the strength of the line to retain the ink and then deliver it on the paper—things time and experience alone can prove. That it is very beautiful, those who have seen the specimens will not deny, and very simple—just the thing for the artist, the amateur, and the forger who wants to produce or re-produce a few choice impressions. To the producer of spurious notes it will prove an easy means of effecting his object.

I am, &c., JOHN LEIGHTON.

Proceedings of Institutions.

BIRMINGHAM AND MIDLAND INSTITUTE.—The report presented at the annual meeting, held January 11th, William Scholefield, Esq., M.P., President, in the chair, states that the external appearance of the building has undergone a great change by the erection on the adjacent land of the Central Reference Library, which is now fast approaching completion. The exterior of the new building follows, with but slight alteration, the original design of Mr. Barry, so that the whole façade will have a uniform appearance. The interesting collection of works of art which was opened for exhibition to the persons attending the last annual meeting was, at the urgent request of many members, retained for two days following the meeting, and proved very attractive, about 1,500 persons visiting it during that time. The number of members of the Institute is about the same as at the commencement of the year. The number of guinea subcribers still falls short of 700, and the council are impressed with the fact that that number is wholly disproportionate to the population and wealth of the town. Thirty lectures have been delivered during the past year, as against twenty-nine in 1862; among them may be mentioned two on "Æronautics," by Mr. James Glaisher, F.R.S.; one on "Water and its circulation through Rocks," and one on "Volcanoes and Earthquakes," by Professor Ansted, F.R.S.; two on "The new applications of Science illustrated in the International Exhibition," by Mr. Robert Hunt, F.R.S.; one on "The Inner Life of the House of Commons," by Mr. Shirley Brooks; two on the "Life of Dr. Johnson," by Mr. George Dawson, M.A.; one on "English Literature," by the Rev. A. J. D. D'Orsey; two on "The Progress of Civilization" (illustrated by collections of coins) by Mr. H. Noel Humphreys; one on "Socrates," and one on "Sir Thomas More," by Mr. George Dawson. There was a decided improvement in the attendance. Believing that it was peculiarly within the province of the Institute to call attention to recent advances and discoveries in the application of science to manufactures, the council made arrangements for the delivery in the course of last spring term of a series of lectures on the Exhibition of 1862. The subjects chosen bore especial reference to the manufactures of the district, and the lectures were designed to illustrate the progress made in those branches of manufacture since the Exhibition of 1851. These lectures were as follows:—"Mining and Metallurgy," by Mr. R. Hunt, F.R.S.; "Chemistry of the Exhibition," by Mr. W. Crookes; "General Metal Work," by Mr. W. C. Aitken; "Works in Precious Metals, Ecclesiastical and other Metal Work," by Mr. F. Skidmore; "Stained and other Glass," by Mr. John Powell; "Design as shown in Works exhibited in the Exhibition," by Professor Chamberlain. The council secured for this course the services of several gentlemen who had practical acquaintance with the different subjects to be treated, and the series was consequently one of great interest. Tickets were issued to artizans for the course at a reduced charge, but the Council regret that only a very limited number of tickets were sold. The number of persons visiting the Museum during the past year has been 1617. The number of visitors to the Specification Library has increased, being 626 in 1863 against 578 in 1862. The meteorological observations have been regularly continued during the past year. A valuable collection of works of art, known by the name of the Warwickshire Drawings, has been arranged and placed in the news room, and has proved to be of great interest. All

friends of the Institution will deplore the premature loss of Sir Francis Scott, who so energetically and faithfully served its cause, and has bequeathed to it his valuable collection of Limoges enamels. The bequest is accompanied by a legacy of £50, for providing a suitable case "for the continued protection and public exhibition of the said enamels." In the Industrial Department, several changes of considerable importance have taken place. The class for practical mechanics has proved highly successful. The German class, also, is a thriving and increasing one. A change has been made with reference to the chemistry class; as the course of instruction in that science extends over two years, it has been thought desirable that a second class should be provided, so that the students in their first and second years should be distributed into two separate divisions. The result is at present highly satisfactory, the number of chemistry students being larger than at any former period. A class on Saturday evenings for elementary singing has been opened, the admission being a penny a night for each person. This class has been in existence during the autumn term, and has been very successful. The attendance at the penny arithmetic class has been, week after week, so large that the room has been most inconveniently crowded. In order to afford increased accommodation for this class, the Council have recently fitted up a second room, which will be occupied by the more advanced students. Following up the successful experiment which was tried in 1862, the Council induced the president, Mr. Scholefield, to inaugurate the autumn term by an address to the students and members, of whom a large audience assembled on the occasion. The address was a very able and interesting one, and the Council feel much indebted to Mr. Scholefield for the manner in which he carried out their wishes. The Council announce with great regret the loss they have suffered in the resignation of several of the teachers of the classes, whose efficiency they warmly acknowledge. The usual examinations by the Department of Science and Art and the Society of Arts were held in the spring. A considerable number of students from the Institute classes presented themselves for the former, and the results are highly satisfactory. The Society of Arts examinations were attended by a smaller number than usual of the Institute students. The income and expenditure accounts show that the general financial result of the year is an excess of income over expenditure of £22 9s. 10d. The comparatively small sum of £81 3s. 2d. would entirely free the Institute from every existing liability.

Hunslet Mechanics' Institution (Yorkshire Union).—The annual meeting was held on the 28th January; Mr. Ald. Blackburn, the president, in the chair. The report gave a favourable account of the state and progress of the Institution. The number of members had increased from 305 to 364, and the attendance at the classes had also considerably improved. The treasurer's account showed that, notwithstanding much larger receipts, there was a balance of £17 14s. against the Institute, owing to an outlay for repairs, fittings and furniture, and additions to the library. The debt on the building had been reduced from £588 18s. to £500, and several promises had been made for further reduction.

Metropolitan Association for Promoting the Education of Adults.—The first annual meeting was held on the 29th ult., in the house of the Society of Arts, Vice-Chancellor Sir W. Page Wood in the chair. Mr. Harry Chester, chairman of the committee, read the report, which stated that his Royal Highness the Prince of Wales had signified his consent to become a patron of the Association, and to contribute to its funds a life member's payment of £10 10s. Earl Granville, Lord President of the Council, had accepted the office of president. The operations of the Association embraced the whole of the metropolis, and under the term adult comprehended all those members of the industrial classes who have reached the present ordinary maximum school age of elementary schools for the poor, viz., the age of 12 years. The report, after describing in detail the organisation and machinery of the Association, reviewed its operations during the fifteen months that have elapsed since the provisional committee, charged with the duty of constituting it, and bringing the association into operation, was appointed, on the 2nd of November, 1862, at a public meeting presided over by Sir W. Page Wood. By the 13th of December, 1862, the committee of management was constituted, and began to take measures to set the association to work. The time was short, for the earliest examinations were to be held in the ensuing March. Public meetings, at which deputations from the association attended, were held, and various publications were freely distributed, to make known to the working classes, and to the friends of public education in the metropolis, the existence of the new association, its objects, and its modes of operation. Notwithstanding the shortness of the notice, 229 candidates presented themselves at the examinations, and 89 succeeded in obtaining certificates. The report touched upon most of the Institutes connected with the Association. It mentioned the Youths' Institute, Bayswater, as an institution of great interest and promise. It was established in January, 1860. It has a reading-room, a library, a penny bank, a cricket club, a gymnasium, occasional excursions, lectures, and concerts. It has also Bible classes, classes for writing, arithmetic, book-keeping, and drawing. Although these novel institutions have stood the test of experiment for only a few years, they appear to promise excellent results; and the experiment of establishing them may advantageously be tried in many other parts of London. After referring to police instruction classes and the various working-men's institutes, the report next referred to working-men's clubs, some of which may be regarded as educational institutes, for they are places where, with other advantages, systematic instruction is regularly provided; and even in inferior clubs where there is no such provision, if they are fairly conducted, they tend with great effect towards the improvement of their members. The first established working-men's club in London, the Westminster Working-men's Club and Reading-rooms, is that which owes its origin and its continued existence almost entirely to the benevolent exertions of Miss Adeline Cooper. The Association desires to encourage industrial instruction and training, particularly for females; but this subject is full of difficulties. The poor too often fail to appreciate its importance. They look with disfavour on attempts to give systematic and practical instruction in industry to their children. Time thus devoted seems to them too frequently to be time abstracted from mental instruction, from learning, and therefore time thrown away. Here, as at every other turn, the promoters of education are obstructed by difficulties arising out of the ignorance and prejudices of uneducated parents. The remedies are to diminish the number of uneducated parents by extending the means of education, and especially by extending the means of educating adults, and also by inviting their co-operation, as far as possible, in the work of educating their children. The association desires also to direct the attention of the managers of schools to the importance of physical education. The games of the Kinder-garten are useful, not only in training the eye but in increasing the general intelligence, the cheerfulness, and the health of the children. As they grow older and stronger they should be furnished with opportunities for playing at games and exercises which not only train the eye and the hand, but develop and invigorate the form, and promote agility, strength, and health. The annual account, comparing receipts and payments, shows there is a balance of £8 11s. 2d. in favour of the association, but, taking liabilities into account, it is £7 14s. 10d. the other way. The committee earnestly appeal to the friends of education for funds to enable this work to be carried out. The funds at the disposal of the committee have not hitherto been such as to warrant the occupation of the whole time

of a paid officer. The services of Mr. Sales, as secretary, have deserved the hearty approval of the committee. The Chairman, after the reading of the report, proposed that they should elect his Royal Highness the Prince of Wales patron by acclamation. Trained and educated as few Princes of Royal blood had been, he had ever shown himself eager to promote all the educational and benevolent efforts for the improvement of the people which were so largely patronised by his late lamented father. In remarking on the proceedings of the association he expressed the gratification he felt at finding that it had been able to do so much with so small a sum as £112, and hoped that the slight addition to that amount asked for in the report would be forthcoming to enable the committee to fulfil their desires for the forthcoming year. He then proceeded to address the pupils connected with the various institutions to whom certificates and prizes had been awarded by the examiners, for proficiency in religious instruction.—A cordial vote of thanks was given to the chairman, who, in responding, warmly expressed the deep interest he took in the success of the Association.

Pimlico Literary, Scientific, and Mechanics' Institution.—This Institution is now in full possession of the premises built for its occupation, and forming part of the building known as the "Pimlico Rooms." A public meeting, at which Earl Grosvenor will preside, is to be held on the 5th of February, to form a Local Educational Board. Several new classes are projected, and, in addition to those which have been formed now a long time, two have recently assembled—the first for the study of book-keeping, &c., under the tuition of Mr. William Vaughan, winner of the Prince Consort's Prize in the past year; and the second for instruction in chemistry, by Mr. F. Coles, a certificated teacher of the Science and Art Department. The second series of lectures, &c., for the session is enriched by four to be given by Mr. H. F. Chorley, on "Music."

Fine Arts.

ART COLLECTIONS AT SOUTH KENSINGTON.

The Department of Science and Art have just issued their new edition of the "Inventory of objects forming the Art Collections of the Museum at South Kensington." The inventory has been entirely revised and rearranged. As nearly as possible, the price, size, and other details, accompany each object. For the information of visitors, "an alphabetical list of artists, art workmen and producers who are named in the inventory" is inserted in the introduction, and, for lovers of statistics, "analyses of the art objects arranged under chronology, and under countries, according to the present classification;" a table of the "approximate cost of each class," and an index of the "species of objects named." It may be interesting to know something of the history and origin of this valuable collection, and the following is an extract taken from the introduction:—

"1. The commencement of the collections forming the Art Museum dates from the year 1846, when a committee, appointed by the Board of Trade, recommended that a Museum should be formed in connection with a School of Design at Somerset House, which should exhibit to the students of the school, to inquiring manufacturers, artisans, and the public in general, the application of the principles of design in the graceful arrangements of forms, and the harmonious combination of colours. Some few specimens were procured in accordance with this recommendation.

"2. Numerous objects collected from the Exhibition of 1851 were purchased with a Parliamentary grant of £5,000 made to the Board of Trade (the Right Hon. H. Labouchere, M.P., President, now Lord Taunton). The specimens thus obtained consisted of examples of furniture, metal work, pottery, and woven fabrics, and were selected by a committee consisting of Mr. Cole, C.B., Mr. Owen Jones, Mr. Pugin, and Mr. Redgrave, R.A., who, in forming this collection, looked to its becoming the nucleus of a museum of ornamental manufactures.

"3. In 1852, the Department of Practical Art of the Board of Trade was constituted (the Right Hon. H. Labouchere, M.P., President), and the collection already made was publicly exhibited in the rooms of Marlborough House; and in that year the Bandinel collection, illustrative of pottery and porcelain, was acquired (the Right Hon. J. W. Henley, President).

"4. In 1854, Parliament made a vote for purchases from the collection of Mr. Bernal. Upwards of £8,583 was expended by the Department of Science and Art, under the authority of the Board of Trade (the Right Hon. Lord Stanley of Alderley, President), principally in specimens of pottery and porcelain, majolica ware, glass, and metal work, approved upon the recommendation of Mr. Redgrave, R.A. The Gherdani collection of models for sculpture was bought by the Chancellor of the Exchequer for £2,110 (the Right Hon. W. Gladstone, M.P.), and placed in the Art Museum.

"5. In 1855, £3,500 was expended in purchases from the Paris Exhibition, selected by Mr. Cole and Mr. Redgrave.

"6. The Soulages collection, which was especially rich in majolica ware and specimens of Italian furniture, was brought to England by means of a guarantee fund, headed by the Prince Consort, in 1856, and finally deposited in the museum of the department. Purchases have been made from it, amounting to upwards of £8,000 (the Right Hon. the Marquess of Salisbury, K.G., and the Earl Granville, K.G., being Lords Presidents).

"7. In 1857, the Department was transferred from the Board of Trade to the Committee of Council on Education, and shortly afterwards the Museum and offices were moved from Marlborough House to South Kensington.

"8. 1858-9, Mr. Cole, being in Italy, made notes of numerous objects worthy of purchase; and in 1859-60 Mr. Redgrave and Mr. Robinson went to Italy to effect the purchase of such objects, and numerous purchases were made.

"9. In 1860 the Gigli portion of the collection, made by the Marquis Campana, consisting of examples of Italian sculpture, was selected by Mr. Robinson, and purchased for the sum of £6,000.

"10. In 1861 the sale of the Soltikoff collection took place in Paris, and upwards of £5,982 was expended in the purchase of objects from that collection. Other additions were also made in that year from the sale of Mr. Uzielli's collection.

"11. The International Exhibition of 1862 offered opportunities of acquiring specimens of modern art manufacture, British and foreign, and objects were thus obtained, which cost altogether £3,947 (the Right Hon. the Earl Granville, K.G., being Lord President).

"12. Such have been the principal sources from which the collections have been formed. In addition, numerous other purchases have been made by means of annual votes of Parliament.

"13. The present inventory contains all objects belonging to the Art Museum, registered up to the 30th June, 1863, except casts and reproductions, which are separately inventoried. It is arranged in divisions, according to the nature of the specimens, such as sculpture, mosaics, pottery, furniture, &c. The first number is the finding No., the second (within brackets) is the present number in the Register of the Department. In cases in which a price is not named, such specimens have been purchased in lots with others or presented."

MODERN WOOD-CARVING.

A correspondent, who has studied the subject with care and had many opportunities of attaining knowledge upon it, sends the following remarks and suggestions on the

nature of wood-carving, and its application to modern uses:—

It is an error, common to all professors of modern art, to look rather for the extreme of delicacy in execution and faithful imitation of an original—whether in nature or not, than to the broader consideration of how best to supply what is wanted for use. With some noteworthy exceptions, our exhibitors of wood-carvings at the Society's house last summer seemed not a little at sea with regard to the ends of their own art. We had *tours de force* of exquisite workmanship in wood that should rather have shown itself in ivory, the precious metals, or bronze; we had elaborate toys—fit only for boudoirs, and toys in the shape of trivial imitations of birds and beasts, such as offend against the canons of decorative art in a lamentable manner. Most unfortunate of the whole gathering were the numerous attempts at reproducing pictures in relief.

By way of exemplifying what is a legitimate application of the art in question to decorative purposes, yet in no way asserting that the example should be mechanically imitated, we may refer to the Gothic wood-carvings which remain in our cathedrals. We may turn to the *miserere* seats, and, limiting the case to one instance, to those of Wells Cathedral; of these, Messrs. Cundall and Downes have recently published photographs, to which we would gladly apply for illustration. The Wells *miserere* seats were produced in the best time of English mediæval art; they are very slightly injured, some not at all; they are innocent of the restorer, have none of that archaism of style which is popularly dreaded, and, with few exceptions, are so slightly "ecclesiastical" in character that they might be turned, without offence, into wall-brackets for modern domestic use.

Nothing could be freer in design, yet nothing more admirably adapted to their uses than these works. We find in them subtle illustrations of the application of curves and the disposition of masses. It is less to these qualities than to their *execution* — in the restricted sense of the word—to which we call attention. Variety is their law. Be the subjects oak-leaves, roses, or what not, in symmetrically arranged rosettes, or more cunning combinations, their stems are crisp, as with life running within, and really seem bent alive; they are freely rounded and flow with rich modelling of the surface—not at all like the mere pipes we meet with in modern art; their pedicels rise in the natural order from the bough, being opposed alternate, or springing from one side only, as the case may be, and combine with infinite changes of character. The leaves themselves are true in every fibrous band, in every form of edge; and, be they serrated, indented, or pointed, are such as nature makes. With all their freshness, variety, and crispness they do not in any case approach to imitation nor descend to copying; the leading natural expression of each example is seized and dwelt upon. In execution there is nothing to be desired for such works that may not be found here.

It is this act of selection, which obtained no less with the Greeks than with the Gothic carvers, that we commend to modern craftsmen. The sin of *rococo*, the phase of art most opposed to that commended, lies in its having no meaning; its idiocy—so to say, is patent, and its advocates, having abandoned nature for a wilful choice of meaningless curves, find those forms to be so limited that the art itself soon grows little else than poverty-stricken repetition, and the artist's interest in his work fades with its narrowed scope. Long ago *rococo* sunk into mere flourishing, triter than that our old-fashioned writing-masters delighted in. An attempt to revive *rococo* is to begin at the wrong end, and much as if having power to resuscitate the dead, we exercised it upon worn-out and diseased corpses rather than those of the young. We shall never do anything in Art so long as we neglect the intelligence of the workman, and call upon him to respect mere flourishes, the aberrations of *rococo*.

The Gothic decorative carvers wrought upon principles which, when fairly considered, show them possessed of subtle knowledge in art, and willing to bear their part in one of the most complete schemes for decoration the world has known. Fundamentally, their law forbad mere imitation of objects as stringently as did that of the Greeks. The latter carried their obedience still further than did the former, and often conventionalized natural forms until they parted with resemblance to nature altogether, and got a thing which was abstractly or geometrically beautiful, but void of suggestiveness, and not unfrequently without appropriate application. "Our rude forefathers" stopped when it seemed good to them to do so, and exhibited enough of the true character of their models to point out wherein lay the secret of their beauty. This selection did not so much *formalize* as it *emphasized* the grace of nature, so that while, for example, the carvers passed over the ultimate veins of a vine-leaf, they did not omit to tell broadly how greatly they enjoyed the rich massing of its shadows, the elegance of its outline, and the grace of its far-shooting tendrils. They would sometimes, it is true, represent accidental deformities and specialties, but in so doing they obeyed the *spirit* of the law they went by, and showed—as in the drooping or insect-bitten vine-leaf—something of its biography, so to say, more pathetic than would appear in maintaining that all flesh was *not* grass by for ever representing perfected life. Down even to these little things does the ruling spirit of Christian art pathetically declare itself to be different from the gloriously beautiful, but unpathetic classic design. In respect to Art it will generally appear that these abnormal incidents have value in composition or arrangement of line.

It is important to remind the producers of the numerous copies in relief from pictures which found places in the Adelphi, that justly to represent perspective views in alto-relief is impossible; some of the greatest masters of ancient art have failed in the attempt. Albert Durer's carving in speckstein, "The Birth of St. John," now in the British Museum, is so complete a failure, and withal so beautiful, that one regrets he did not make a picture of it. Ghiberti endeavoured to evade the difficulty by treating parts of his sculptured pictures on the gates of San Giovanni in different planes, and did not succeed.

There was a class of works shown in the Adelphi which did not come under any of the heads above named. In some respects this was the most meritorious of all. Its examples resulted from an application of the principles of sculptured art to the production of extrinsic ornaments, *i.e.*, decorations imposed upon and not developed from the form or structure of the object to be ornamented. The very excellence of these works removed them from the decorative class altogether, and ranked then as a low kind of sculpture rather than a high kind of decoration. Thus considered, the use of extrinsic ornamentation is as legitimate as is the introduction of sculptures *per se* into rooms, but it is not what is most required for service. Such carving has a tendency to sink into imitation, without design and without feeling. Done well, it must be too costly for ordinary use. What is wanted for general service is something which shall banish for ever the hideous and unmeaning flourishes of modern *rococo*, so common in our upholsterers' shops. The exquisite sculptures in wood by Mr. Flipping—"The fish and shell panels for a sideboard" (60), are worthy to be possessed by a Raphael or a Shakespeare, but they will do nothing towards introducing good decorative art among the people. Judging these works by their own standard, they are infinitely truer than any by G. Gibbons, being more elegant in form than are the works of John Evelyn's *protégé*, whose feeling for form was a little Dutch, and needed chastening. Mr. Rogers's panel, "Dead Game, &c." (23) is a superb piece of sculpture, bold as Snyders might have made it.

Dublin Exhibition.—The Royal Dublin Society having resolved to include a gallery of fine arts in the Exhibition

to be held during the summer of 1864, it is proposed that the gallery shall comprise a collection of modern paintings in oil and water colours, miniatures, enamels, and similar works of art. At its last Exhibition, in 1861, the Society was honoured with contributions from the collections of the Queen, the late Prince Consort, and the King of the Belgians; also from the Hampton Court, Sheepshanks, Vernon, and many other celebrated galleries; while upon that and on former occasions, the appeals of the Society for the co-operation of artists and private collectors were most liberally met. The Society's last Exhibition was attended by upwards of 208,000 visitors. The Exhibition will open early in May, and will continue open for a period not exceeding six months. Works intended for exhibition must be sent in before the 20th of April, 1864. Exhibitors are requested to forward a concise description of all objects contributed. No person will be allowed to take copies, drawings, or photographs of the pictures or other objects without the previous consent of their respective owners; and in all cases, contact with or measurement by any instrument of the original picture, or other object, will be strictly prohibited. The committee will direct their earnest attention to measures for the protection and proper arrangements of the objects contributed on loan; but they will not be responsible for loss or injury under any circumstances whatever. The committee will defray the charges for freight or carriage from any port or railway station in the United Kingdom, upon works accepted by them, and transmitted according to their instructions; and in the case of pictures, and other objects so transmitted from foreign countries, they will likewise defray the freight from and back to the foreign seaports indicated in such instructions. All works sent in without the committee's previous instructions for their transmission to the gallery, must be carriage paid. The committee reserve the power of declining to exhibit works which they may consider unsuited to the collection, or which cannot be conveniently arranged in the building. No picture, or other work exhibited, can, under any circumstances, be removed from its place until the final close of the Exhibition, unless by special leave of the committee. Distinctive labels will be attached to such works as are intended for sale, the prices of which shall be entered in a book to be kept by an officer of the Exhibition. A commission of 5 per cent. on all sales shall be paid into the Exhibition fund. The committee entrusted with the management of the fine arts gallery solicit the loan of paintings and other works suitable to the collection, and they request that all offers to contribute may be sent in at the earliest convenience of those persons who intend to favour them with objects for the Exhibition. Communications upon this subject may be addressed to the Honorary Secretary, Fine Arts Department, Exhibition of 1864, Royal Dublin Society, Kildare-street, Dublin.

THE ADORNMENT OF ST. PAUL'S CATHEDRAL.—A meeting of gentlemen in the city of London, who have formed themselves into a committee for carrying out the interior adornment of St. Paul's Cathedral, as originally designed by Sir Christopher Wren, was held on the 27th of January, at the Mansion-house, the Lord Mayor presiding. The work has been proceeding gradually since 1858, and in the interval about £10,000 have been subscribed towards it, exclusive of nearly £600, (which sum has recently been made up by guinea subscriptions alone,) and of £750 given by the Corporation of London, £200 each by five of the City Companies, £550 by the Goldsmiths' Company for a memorial window, £1,000 and £100 by Mr. Brown (Longman, Brown and Co.) and Mr. Butterworth respectively for similar purposes, and £400 by the Drapers' Company. The estimated cost of the whole work is understood to be from £60,000 to £70,000, and it is now proposed to raise the remainder of the money by a guinea subscription open to the whole country, but will not exclude larger donations by persons disposed to present them. Mr. Shone, the secretary to the fund, stated that there were no revenues at the disposal of the Dean and Chapter for the adornment of the Metropolitan National Church; and read a letter addressed to the Lord Mayor, by Mr. Francis Fuller, of Cornhill, to the effect that, if 400 gentlemen could be found to charge themselves with the responsibility of collecting £100 each, the sum of £40,000 could be easily raised within the next two years, and he should be willing to be one of the 400; or, if preferred, he should be willing to be one of forty, who should in that case charge themselves with the responsibility of collecting £1,000 each within the same time. The consideration of Mr. Fuller's proposition was eventually adjourned. The Lord Mayor said the Dean and Chapter did not share in the increased value of the Cathedral property which had accrued by lapse of time. Of that the Ecclesiastical Commissioners had the advantage.

WEDGWOOD INSTITUTE AT BURSLEM.—The competition designs for ornamenting this Institute are now being exhibited at the South Kensington Museum, in the iron building near to the works sent in competition for the Art Workmanship prizes of the Society of Arts.

Manufactures.

DANGEROUS OIL LAMPS.—The recent destruction of the vessel *Lotty Sleigh*, in the Mersey, by an explosion of gunpowder originating in an accident with a petroleum lamp, has forcibly directed the attention of the public to the frequency of these accidents, and the question is being constantly raised as to whether or not lamps burning mineral or hydro-carbon oils can be used with safety. The *Ironmonger* states that "these accidents have arisen from the employment of badly rectified and consequently dangerous oils. An oil that requires to be heated to 120° before it can be set on fire, may be regarded as practically safe. Of course it is very desirable that its inflaming point should be several degrees higher, as in proportion as the point rises so does the oil become more and more safe. It may be asked, why do not the manufacturers issue oils from which the lighter spirit has been removed by careful rectification. The answer is easy, the lighter spirits are not as valuable commercially as the burning oil, consequently there is a larger amount of profit if they are permitted to remain, and there is a possibility of supplying the retailer at a lower price. Hence it is to the desire of the consumer for a cheap oil, to that of the retailer for a larger profit, and the aim of the manufacturer to make cheaply, so as to sell cheaply, that all these accidents may be attributed. Let it not be imagined that the manufacturers are always to blame. In one fatal case that came under our notice the dangerous character of the oil was due to the retailer, who bought a quantity of light spirit at a reduction of 5d. per gallon on the price of safe burning oil, and mixed the two together so as to get an increased profit on the sale. The recklessness with which the lighter spirits are used is really a matter of astonishment. An accident occurred recently to a servant girl in the Brixton-road; we obtained a sample of the so-called pyrogen, and found that it ignited readily at the ordinary temperature of the atmosphere—giving off an inflammable vapour that could be ignited several inches from the surface of the oil, at 54° Fahrenheit. The oil that caused the fatal accident at Oxenhope, where three persons were destroyed, ignited at 98°, and in no case have we been able to trace any accident to an oil requiring as high a temperature as 120° for its ignition. The remedy for these accidents is in the hands of the consumers. There is an abundant supply of perfectly safe oils in the market, both paraffin and petroleum; and if buyers would refuse to purchase an oil, the igniting point of which is under 125°, there would be no more fatal events of this kind. The Petroleum Act requires that premises where more than 30 gallons of petroleum or any product thereof are stored should be approved and

licensed. It does not apply to coal-tar, naphtha, benzine, spirit of turpentine, and other equally dangerous and explosive liquids. Nor does it prevent any vendor selling an oil or naphtha, however dangerous, and without any caution as to its character, provided he takes care never to have a stock exceeding 39 gallons on his premises."

The Patent Law.—Mr. Bright, M.P., in his recent speech before the Birmingham Chamber of Commerce, said: "I understand that at Liverpool there are some influential persons who think that patents ought to be altogether abolished, and that inventors should be remunerated out of a fund to be awarded to them in some way by the Government, and that, if possible, it would be desirable to have an international fund provided by the various countries of Europe and by America, out of which they should receive a fitting compensation. On the face of it this proposition looks extremely reasonable, but I believe its carrying out would be impracticable, and that it would be impossible to make any equal adjudication, because it is often many years before anybody can tell whether a patent has really been valuable, and whether the public have gained much from it or not. I am not very much alarmed at the prospect of the total abolition of patents, and I am not sure, after my experience, which, I am sorry to say, has been considerable, that the public would lose anything by the abolition; and, looking at all that is won and lost by inventions among inventors, I am not certain that inventors would be the losers if there were no patents at all. I believe that not one in twenty of them makes his expenses, and that a good many out of twenty are nearly ruined. There is nothing to prevent the production of useful inventions; the fame attaching to them would be quite a sufficient stimulus with many men to exert their talents in that direction; but, leaving that point, there is the question of the existing law, and no man can have paid great attention to the present law, or rather no law, because, in point of fact, there is no law,—no man can have examined that law without feeling that there is ample room for extensive alteration and amendment. In my opinion, patents are granted in many cases for very insignificant things, and they are nothing but a nuisance to the trade with which they are connected. Frequently the improvements are so trifling, almost so childish, that it is quite absurd to give a man a monopoly which may be the cause of harassing every extensive manufacturing operation. To my mind it would be a great improvement if there were some previous examination of inventions, for the purpose of ascertaining whether the invention is worth a patent, and, if it is not, the patent ought to be refused. In addition to the drawings that are necessary, an exact model of the invention ought to be furnished, so that you might ascertain the exact invention for which the patent was granted. I believe that the plan of models has been adopted in the United States. I do not know much of their law generally, but I believe that to be the case. I think the present system of drawing specifications to be a system of fraud to a very large extent. A man attempts to conceal his invention rather than to explain it, and the wording is so vague that when a conflict arises with some one who he supposes has infringed his patent, he dare not tell you what he claims, and his counsel will fight for days to avoid telling you what the inventor claims and what he has invented, and if it is said, 'This is old,' he says, 'I do not claim that, that is not in my specification;' but if you have not proved it to be old, he will say, 'That is exactly what I do claim.' You are placed in a maze of difficulties, and may go on litigating for years, and it is difficult to say whether you are more near ruin when you have lost than when you have gained your cause. The present law is, in my opinion, so scandalous that it would be better to have none at all. There are multitudes of cases which it is impossible to try in our ordinary courts of justice, and if men could only put aside their wish to conquer, they would find it much easier to toss up for the purpose of ascertaining whether the patent is good, or whether the alleged infringement is an infringement or not. In 99 cases out of every 100 the decision would be as if a long litigation had taken place, and more money would be saved by avoiding the costs than the whole of the patent is worth. I have been, and am now, the victim of this law. Oliver Cromwell, when describing the law in his time, said that it was a 'tortuous ungodly jungle;' and I may say with regard to our patent law that it is a disgrace to any civilized country."

Substitute for Felt.—An improved drying fabric for use in paper-making has been invented. It consists in the substituting of a peculiar kind of cloth, composed of many threads and webs all bound together in the weaving and forming one cloth, for the ordinary felt now in use.

Paper-making Machinery.—An American invention has recently been patented in this country, consisting principally in the arrangement of two or more cylinders moved so as to deliver their webs of paper one upon another, for being pressed together to form boards of any required thickness, and apparatus for drying and calendering such board in the continuous length, previously to cutting into sheets, by which the board is made ready for the market in one continuous operation, the object being to economise room, save labour, and prevent waste of the stuff. There is a new system of troughs and spouts, connected with pipes and valves for regulating the supply of stuff to the machines, and a peculiar arrangement of the press rolls and cylinders for drying and calendering either boards or paper, and the combination of new cutting apparatus, and a piling table.

Commerce.

Coffee.—The amount of coffee retained for home consumption in the United Kingdom was, for the year 1862, 34,451,766 lbs. It appears that the largest quantity retained for consumption in any one of the fourteen previous years was 37,350,924 lbs., in 1854, and the smallest 31,166,358 lbs., in 1850.

Sugar.—There were retained for home consumption in the United Kingdom in the year 1862, of raw sugar, 9,111,879 cwts., of which 4,651,762 were from British possessions, and 4,460,117 foreign; a total quantity larger than in any of the previous fourteen years.

Tea.—The quantity of tea imported into and retained for home consumption in the United Kingdom for the year 1862, was 78,793,978 lbs., being a larger quantity than in any one of the preceding fourteen years; the quantity in 1848 was only 48,734,789 lbs.

Timber.—The total quantity of timber, not sawn or split, imported into and retained for home consumption in the United Kingdom, in the year 1862, was 1,303,208 loads, exceeding the quantity in any one year of the previous fourteen. The smallest quantity imported in any one year of that period was 842,877 loads, in the year 1849.

Tobacco.—Of manufactured tabacco, cigars, and snuff there was retained for home consumption in 1862, 331,544lbs., whilst of unmanufactured tobacco 35,093,444 lbs. were admitted for home consumption, a larger quantity than in any previous year.

Spirits.—The quantities of foreign spirit retained for home consumption in the United Kingdom for the year 1862, were—rum, 3,319,579 gallons; brandy, 1,698,426 gallons; and of other foreign and colonial spirits, 175,324 gallons.

Methylated Spirits.—The quantity methylated in 1862 was 632,225 gals.; in 1863, 748,164 gals. The Commissioners of Inland Revenue, in their report, observe: "It is scarcely too much to say that if this mixture had not been devised for the relief of our manufacturers it would have been almost impossible to maintain the present high rate of duty. Illicit distillation must have been largely developed in all our great cities, which are now (in England and Scotland at least) very little infected by it

the unscrupulous traders would have been the customers of the smuggler, thereby injuring both the licensed distiller and their more honest rivals in trade; and those who carried on their business by the use of the legal material only, would have been so burdened by the duty as to compete at a grievous disadvantage with the foreigner. Hence would have arisen a clamour against a tax fraught with so many evils, which it would have been difficult to resist. It is not surprising, therefore, that we regard with unusual anxiety any attempts to neutralize the beneficial effects of this invention by the purification of the mixture so as to render it potable. Hitherto no such attempts—and several have been made—have proved successful. Indeed they have only served to confirm us in the belief that we have nothing to fear on that score. It is true that some aproach to purification may be obtained, but then it is by a process so expensive and so laborious that no one in his senses would resort to it instead of making the spirit at once from molasses, an operation which, while it is in no respect more illegal and dangerous, is infinitely less expensive and protracted."

Beet Root Spirit.—The experiments in this direction in this country do not offer much prospect of success. The distilleries have now dwindled to two. One of these has worked only five weeks this season, producing 1817 gallons of spirits from 139½ tons of roots, being an average of 13 gallons per ton. The proprietor of this distillery has since left his farm, and sought to transfer his license to his tenant, who was formerly his labourer; but as the licenses were originally granted only to persons of responsibility, and for the purpose of experiment, the Commissioners of Inland Revenue have not thought proper to allow the transfer. The other distillery has been at work during 19 weeks. The work has been carried on slowly this season, and the produce has been on the average about the same for each ton of roots as at the other distillery. The quality of the spirit is still such that it is almost wholly used for methylation.

Exportation of British Spirits.—It appears that there has been a considerable increase in the exportation of British spirits, compensating the distillers in some degree for the deficiencies in the demand for the home market. There appears, by the returns for the year 1863, to be a very large increase in the exportation to the west coast of Africa and to Turkey; indeed it may be said that a new trade has been created in the latter country. This, it is believed, is owing to the war in America, which has stopped the supplies hitherto drawn from that country. There is also a large increase in the trade with Italy, probably connected with the attention which has lately been directed to the manufacture of wine in Piedmont and Tuscany, as an article of commerce. The total quantity of British spirits exported in 1863 was 4,410,948 gals., as against 3,926,242 in 1862.

The Ivory Trade.—At the close of the last century England did not work more than 192,600lb. of ivory per annum; in 1827 the demand had risen to 364,784lb., which supposes the death of 3,040 male elephants per annum, yielding 6,080 tusks, averaging 60lb. each. At present England consumes 1,000,000lb. per annum, or upwards of three times the consumption of 1827; and therefore the number of elephants killed for England alone must be 8,333 or thereabouts. About 4,000 men lose their lives annually in the pursuit after ivory. A tusk weighing 70lb. is considered by the trade a first-class one. Cuvier made a list of the largest tusks found up to his time, and the most considerable one registered by him weighed 350lb. At a late sale of tusks in London, the largest, brought over from Bombay and Zanguebar, weighed from 120lb. to 122lb. Those from Angola averaged 69lb.; those from the Cape and Natal, 106lb.; from Lagos and Egypt, 114lb.; and from Gaboon, 91lb. But these are by no means the largest size to be found at present, for elephant hunters now penetrate further inward into Africa, and therefore meet with older animals. A short time ago an American house cut up a tusk which was not less than 9ft. in length and 8in. in diameter, and weighed 800lb. In 1851 the same house sent over to the London Exhibition the largest piece of sawn ivory ever seen; it was 11ft. in length and 1ft. broad. The dearest ivory is that which is used for billiard-balls. There are several kinds of ivory: that which is brought over from the western coast of Africa, except Gaboon, is much less elastic than other sorts, and not so easily brought to perfect whiteness by the working; it is only used for knife-handles. Since the conquest of Algeria by France, the ivory trade has considerably increased in the North of Africa, which receives its supply from the caravans crossing the desert. The hippopotamus also yields ivory, which is much harder and less elastic than that of the elephant, besides being of much smaller dimensions.

Colonies.

Weather at Adelaide.—Last October was almost the coldest and wettest October known at Adelaide.

Mines in Canada.—A Montreal paper states that a short time since a resident in the township of Durham, county Drummond, discovered a rock on his farm which has since turned out to be an extensive and valuable lead mine, clearly discernible throughout the whole extent of a ridge of land reaching from the Grand Trunk Railway to the St. Francis River, near the village of Ulverton. The copper displays itself in the Lyster-hill Mine, four or five regular veins running parallel to each other, varying from four to eight inches in width, estimated to possess at least 30 per cent. of copper, interspersed with seams of beautiful blue, purple, red, and grey ore, considered to possess from 60 to 70 per cent. of copper. The rock also contains innumerable irregular veins, and indicates in every direction the peculiar green stain, showing an abundant existence of the metal. Shafts are now being sunk with the most encouraging results. Such is the richness of the ore on and near the surface, that an offer was made to the owner of the Lyster-hill Mine to sink a shaft some thirty feet in depth for the mere ore taken out in the excavation. The managers of the Monk Mine, in sinking a shaft in order to reach a vein of copper, have struck an exceedingly rich vein of lead abounding in native silver.

Whaling.—Twenty-four of the Arctic fleet of whalers have arrived at Honolulu, averaging each 1,100 barrels of oil and 400,000lbs. of bone. Whales were very abundant during the season.

The Dutch Colonies.—At the end of next June the annual meeting of the Congress of Rural Economy will be held at Häerlem. Among other subjects to be brought under discussion are the application of steam ploughing to colonial agriculture; the influence to be expected from the railways in Java; the importance of cotton cultivation under the present high prices; the necessity for manuring the sugar plantations; the superior properties of the black variety of sugar cane; the importance of the cultivation of indigo; and an investigation of the reasons why the export of the produce of the *Klapperboom* is not made more available and productive in Java and elsewhere.

Jamaica.—A notice of motion has been given in the House of Assembly: "That an address be presented to the Lieutenant-Governor, praying for a grant of £300 in aid of agricultural and horticultural prizes and exhibitions; also for prizes for the more successful and the more economical cultivation of sugar, cotton, chinchona, cassava, honey, wax, tobacco, and other minor products. This sum to be appropriated and paid by the Governor to such society or societies as may be established in furtherance of these objects." The cultivation of chinchona is still engaging public attention. The House of Assembly has ordered the distribution of such plants as have been raised, so that there might be a fair trial given the experiment. The traction engine has been introduced into Jamaica, and

two of these engines, manufactured to order, are now employed in the transit of produce from the estates to Kingston. Cotton cultivation is steadily extending among the small free-holders in Berbice, and the success of the Hon. L. Porter at Enmore, has stimulated, it seems, other proprietors of estates to try their hand in the same direction.

New Zealand Flax.—A firm has been established at Christchurch, in New Zealand, for manufacturing paper out of the *Phormium tenax*. Branch firms are to be established in every province. It is anticipated that before long paper-making will be a staple trade of New Zealand.

The Kangaroo in Australia.—A Sydney paper states that from some cause or other, the kangaroos have of late greatly increased. In some neighbourhoods they are now so plentiful that with some families their flesh forms a staple article of diet. They are now actually becoming a nuisance in one district, and it is becoming apparent that some system of wholesale destruction will have to be devised for checking their rapid increase, as they threaten soon to overrun the district.

Forthcoming Publications.

A Series of Metric Tables, in which the British standard weights and measures are compared with the metric weights and measures at present in use on the Continent, by C. Hutton Dowling, civil engineer, are announced by *Messrs. Lockwood and Co.*, as to be published at Easter, in demy 8vo, price 10s. 6d. It is thought that such a series of tables for facilitating the ready conversion of metric measures and weights into those of the British standard, and *vice versâ*, will render important service to all engaged in manufacturing, mechanical, or commercial transactions with countries which have adopted the metrical system. These tables were in part originally calculated by the author for his professional use; so great, however, has been the benefit derived from them, that he has been induced to extend them, so as to form a complete collection suitable to all branches of foreign commerce. A Synoptic Table of the Measures and Weights of the Metric System, illustrated with diagrams drawn to the natural scale, by the same author, is also preparing for publication, by *Messrs. W. and A. K. Johnston*, Edinburgh. The size is 65 by 51 inches.

Notes.

Revenue and Expenditure.—The estimated gross revenue for the year ending March 31st, 1863, was £70,050,000; the actual receipt at the Exchequer was £70,603,561, shewing a surplus of £553,561. For the same period the estimated expenditure was £70,040,000; the actual expenditure £69,302,008. This amount is exclusive of the expenditure for fortifications, which was provided for by the creation of annuities and not estimated in the budget.

Taxes.—There were repealed or reduced from the years 1848 to 1862, taxes to the amount of £31,091,467, whilst only £26,947,296 were imposed.

Imports and Exports.—The real value of the total exports of merchandise from the United Kingdom was increased from £115,821,092 in 1854, to £167,189,398 in 1862, whilst the real value of the total imports into the United Kingdom has increased during the same period from £152,389,053 to £226,592,729.

Bernard Palissy.—It is proposed to erect a statue to this famous worker in pottery, at Saintes (Charente-Inférieure), his birthplace.

Education in France.—The *Débats* says that the situation of France as to primary instruction may be summed up as follows:—The number of schools is 82,135, or 16,156 more than in 1848. The scholastic population is 4,732,000, instead of 3,772,000, which shows an increase of nearly a million. The girls' schools form but little less than a third of the totality, or 26,592; the number of pupils in these latter is in a rather larger proportion; that is to say, 1,669,000, or 34 per cent. more. There are besides a certain number of girls who frequent the mixed schools. The infant asylums contain 345,000 children of both sexes. A rivalry has, as is well known, arisen between lay teaching and that of the religious congregations. The *Livre Bleu* gives some details on this subject; the 36,499 communes provided with means of instruction contain 41,426 public free schools, for boys only, or for both sexes. Of this number 37,895, containing 2,145,000 pupils, are directed by laymen, and 3,531, comprising 482,000 scholars, have clerical masters. The teaching in the girls' schools is much more in the hands of the religious congregations than that in the boys, the number of schools being almost equally divided between the lay female teachers and the religious establishments. The quality appears to be superior on the side of the lay teaching, for all the mistresses of that order have received certificates of capacity.

The International Exhibition Building.—The scaffolding under the eastern dome of the International Exhibition building is completed, and the visible taking down of this large framework has commenced. On the 22nd ult., the gold ball and finial, which for the space of two years have overlooked the metropolis, were lowered to the ground by means of ropes and pulleys, and, in spite of the high winds, without accident. On the best authority it is stated that the entire dome will be taken down and removed to Muswell Hill within six weeks. The re-erection of those parts of the building which have been removed, has already been commenced in the Alexandra-park, under the immediate superintendence of Mr. Johnson, the architect, and Mr. Meesom, the engineer. The design for the new building is light and elegant, and appears well suited for the purposes for which it is intended.

The Pneumatic Despatch.—The report of the directors of this company states that various difficulties and delays have arisen from the combined opposition of tenants on the Bedford estate, and that, to avoid a protracted litigation, the main works from Euston-square to the City are being carried by the more circuitous route of Tottenham-court-road, about 800 feet of tube having been already laid down. Other portions of the line are being commenced. The Commissioners of Sewers wish the company to re-consider their route between Fleet-valley and the Post Office, suggesting the desirability of carrying the tube through the grounds of Christ's Hospital, to avoid the obstruction of the traffic in Newgate-street. About 4500 trains have been regularly despatched through the tube during the past half-year from Euston Station to the district post-office in Eversholt-street.

Statue to Rossini.—The Marquis Salamanca and the Chevalier Delahante, in the name of the Society of Roman Railways, have presented to the town of Pesaro a magnificent statue in bronze of Rossini, designed and manufactured by Marochetti. The inauguration of the statue will probably take place on the 29th of February, the anniversary of his birth, when he will attain his 72nd year.

Proposed International Exhibition at Vienna.—It is stated, on good authority, that this exhibition is abandoned for 1866, and proposed to be held in 1870.

Wedgwood Institute, Burslem.—At the first meeting of the Working Men's Committee, on the 26th of January, Mr. Enoch Bourne, from Longport Pottery, was appointed secretary to the committee. The representatives from several manufactories reported satisfactory progress of the working men's subscriptions. From the Hill Pottery £72 was promised, though the canvass was still incomplete. A meeting at Messrs. Elliot and Son's works had unanimously resolved that a day's wages, at least, should be contributed. Progress had been made at Messrs. Davenport and Co.'s works, and the workpeople of Mr. Beech, at the Bell

Works, had determined to contribute—in addition to the amount they had already paid in—a penny in the pound on their weekly earnings until the Memorial Building is completed.

Correspondence.

New Inventions.—Sir,—Two or three projects have been much noticed in the papers of late, which are by no means new inventions. The first is a proposal, by a Frenchman, to add a certain combination of springs to wheel carriages of all descriptions, in order that the very load they carry shall help to drive them on after being once put in motion; an idea without any foundation, as is well known to all mechanicians. I once knew a mechanical genius who had a wheelbarrow constructed with a complicated spring wheel, which he confidently asserted would not only go on of itself when once put in motion, but that it would pull on the man who held the handles. After it was completed and tried, he was glad to have his self-acting springs knocked off, and allow the machine to be turned into a common wheelbarrow. Another project is the old one of perpetual motion by means of a wheel with heavy weights constantly standing out further from the axle on one side than the other. This perpetual motion, as it is called, is accurately described in his "Century of Inventions," by the Marquis of Worcester, and, unlike many of his magnificent foresights, is of course entirely visionary. The centres of gravity of the weights on each side of the wheel are both at exactly the same distance from the axis in all positions, and the wheel is consequently as immovable as a rock. The last I shall refer to is the double-ironed skate, which is a mistake altogether, for unless both the irons bear on the ice, the support of the weight of the body is thrown out from the centre of the foot, and therefore will occasion a greater strain upon the ankle than the common single-ironed skate.—I am, &c., Henry W. Reveley.

Reading.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...R. Geographical, 8½. 1. Dr. Haast, "Mountains and Glaciers of Canterbury Province, New Zealand." 2. Don Antonio Raimondy, "On the Frontier Province of Loroto, in Northern Peru."
Medical, 8½. Dr. Gibb, "On Subglottic Œdema of the Larynx."

Tues. ...Med. and Chirurgical, 8½.
Civil Engineers, 8. Renewed Discussion upon Mr. Redman's paper on "The East Coast, between the Thames and the Wash Estuaries."
Syro-Egyptian, 7½. Mr. W. F. Ainsworth, "On the Site of Capernaum, or Caphar Nahum."
Ethnological, 8. 1. Mr. Augustus Oldfield, "On the Ethnology of Australia."
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Experimental Optics."

Wed. ...Society of Arts, 8. Mr. J. Beavington Atkinson, "On Fresco-Painting as a suitable mode of Mural Decoration."
Graphic, 8.
Microscopical, 8. Annual Meeting.
Literary Fund, 3.
Archæological Assoc., 8½. 1. Mr. Wentworth, "On Heath Old Hall." 2. Mr. Hopper, "On an Inventory of a Yorkshire Chapman." 3. Mr. Baigent, "On the Discovery of a Roman Leaden Coffin at Bishopstoke."

Thur. ...Royal, 8½.
Antiquaries, 8.
R. Society Club, 6.
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Experimental Optics."

Fri.......Astronomical, 3. Annual Meeting.
Royal Inst., 8. Prof. Wanklyn, "On the Synthesis of Organic Bodies."

Sat. ...R. Botanic, 3¾.
Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

Patents.

From Commissioners of Patents Journal, January 29th.

Grants of Provisional Protection.

China, &c., packing for firing—74—S. Woolf.
Coffee urns—46—G. Mead.
Engines—96—T. English.
Fibrous material—80—W. Clark.
Fire-arms, breech-loading—50—R. Adams.
Guns, &c.—85—G. Ash.
Guns, breech-loading—94—G. Wilkins.
Hoops, rails, &c., cast steel—48—J. Ramsbottom.
Horse shoes—64—J. Coppard.
Iron ores, smelting—58—B. Samuelson.
Mines, preventing accidents in—100—W. Denton and J. Whitaker.
Motion, communicating—52—A. J. S. Graham.
Motive power—44—A. M. Basset and L. N. D. Lamoreux.
Motive-power engines—78—J. Lane.
Paper, drying—56—P. McLaurin.
Pontoons—68—W. H. Barlow.
Railway tarpaulins, &c., rendering non-combustible, &c.—66—J. Gibbins.
Railways, removing obstructions on—3299—M. C. E. Houdayer and J. J. Cormier.
Roller blinds—62—J. P. Culver and R. B. Jarvis.
Safety lamps—54—J. Rees.
Scarfs—70—J. S. Jarvis.
Ships, sheathing—88—C. Askew.
Shirts—92—P. McIntyre.
Soap—10—J. L. P. Duroy.
Steam boilers—86—L. E. C. Martin.
Steam engines—18—W. Hall.
Steam engines—76—J. Coates.
Targets—98—J. F. Bland.
Telegraphic apparatus—72—H. A. Bonneville.
Water wheels—82—W. E. Newton.
Weaving—84—C. Little.

Inventions with Complete Specifications Filed.

Ships, steering—193—E. Myers.
Ships, recovering—204—H. A. Bonneville.

Patents Sealed.

1901. W. Cotton.	1921. G. Stevens.
1902. R. A. Brooman.	2000. J. Edmunds.
1904. G. Taylor.	2171. G. Alcan.
1919. J. Abrahams.	2827. B. Marriott and C. Radcliff

From Commissioners of Patents Journal, February 2nd.

Patents Sealed.

1929. G. Clark.	1954. R. A. Brooman.
1933. W. Hodson.	1959. J. Thompson, E. G. Fitton, and F. A. Fitton.
1937. J. E. Dowson.	1960. N. Jarvie and W. Miller.
1939. W. P. Hodgson and J. V. Woodifield.	1964. H. R. Brown.
1940. J. Fenwick.	1966. J. W. Armstrong.
1941. J. Young.	1967. J. A. Fullarton.
1944. G. E. Charageat.	1979. W. B. Haigh.
1945. E. E. Quelle.	1983. J. Wheeler.
1946. J. Kirkham.	2012. E. B. Wilson.
1947. T. Simmelkiar.	2016. N. S. Russell.
1949. W. Jones.	2066. W. Galloway and J. Galloway.
1952. J. W. Slater.	2068. W. Hamilton.
1953. J. H. Johnson.	

Patents on which the Stamp Duty of £50 has been Paid.

212. J. H. Johnson.	246. E. Smith.
244. A. Boyle.	275. H. Bessemer.
248. G. T. Bousfield.	279. W. Prangley.
250. G. T. Bousfield.	291. R. Howarth.
251. G. T. Bousfield.	301. J. Leeming.
219. C. De Bergue.	249. H. Phillips and J. Bennehr.
289. J. Abraham.	263. J. Chatterton.
228. J. A. Shipton.	286. J. G. Marshall.
230. W. Winstanley and J. Kelly, W. Payne and J. Formby.	259. A. Crichton.

Patents on which the Stamp Duty of £100 has been Paid.

278. I. Holden.	491. H. Y. D. Scott.
279. I. Holden.	241. D. Y. Stewart.
380. I. Holden.	267. W. Weild.
281. I. Holden.	285. J. A. Williams.

Registered Designs.

Le jupon Diane—4615—Jan. 21—G. Royle and J. Mills, 32, King-street, Cheapside.
Wrapper for newspapers, periodicals, &c.—4616—Jan. 26—Julius Wittenberg, 12, Clarendon-road, Notting-hill.
A harrow tine—4617—Jan. 29—Plenty and Pain, Eagle Iron Works, Newbury, Berks.
Reliable safety anchor—4618—Jan. 30—E. R. C. Morgan, The Mumbles, near Swansea.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, FEBRUARY 12, 1864. [No. 586. VOL. XII.

Announcements by the Council.

ADDRESS TO HIS ROYAL HIGHNESS THE PRESIDENT.

The following Address of Congratulation has been forwarded for presentation to His Royal Highness the President:—

To HIS ROYAL HIGHNESS THE PRINCE OF WALES, K.G.

May it please Your Royal Highness,

We, the Society for the Encouragement of Arts, Manufactures, and Commerce, respectfully approach Your Royal Highness, as our President, to offer our sincere congratulations on the birth of a son.

We trust that this event will tend to enhance the happiness of yourself and your Royal Consort, and that the heir born under such bright auspices may prove an honour and a blessing to his Royal Parents, as well as to the nation at large.

Sealed with the Seal of the Society, this 10th day of February, 1864, in the presence of

P. LE NEVE FOSTER,
L. S. *Secretary.*

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

FEB. 17.—"On Public and Private Dietaries," a sequel to the paper read on the 16th December last. By DR. EDWARD SMITH, F.R.S.

FEB. 24.—"On Petroleum, its Economic Value, and a Visit to the Petroleum Wells of Canada." By DR. MARCET, F.R.S.

MARCH 2.—"On the Verification of Olive Oil, by means of its Cohesion Figure." By CHARLES TOMLINSON, Esq., Lecturer on Science at King's College School.

CANTOR LECTURES.

Courses of Lectures on the following subjects are arranged for the present Session:—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. HASTINGS, Esq., Barrister-at-Law (already delivered).

Fine Arts Applied to Industry. By W. BURGES, Esq.

Chemistry Applied to the Arts. By Dr. F. CRACE CALVERT, F.R.S.

The second lecture of Mr. Burges's course will be delivered on Monday next, the 15th inst.:—

FEB. 15.—LECTURE II.— *Glass.*—Antique glass, Venetian glass, modern glass (Powell, Chance, &c.); Mediæval stained glass; modern ditto; Mediæval enamels; modern ditto; (Legoste of Paris.)

FEB. 22.—LECTURE III.—*Pottery.*—Etruscan vases (Wedgwood); Italian majolica (Minton); Sèvres china; modern biscuit.

FEB. 29.—LECTURE IV.—*Iron and Brass.*—Antique bronzes; Mediæval ditto; modern French bronzes (Barbédienne); Mediæval dinanderie; modern ditto (Hardman, Hart, &c.); Mediæval and Renaissance wrought iron; modern ditto; cast iron.

MAR. 7.—LECTURE V.—*Gold and Silver.*—Antique and Mediæval plate; modern ditto (Elkington); Antique and Mediæval jewellery; modern ditto; Antique and Mediæval coinage; modern ditto.

MAR. 14.—LECTURE VI.—*Furniture.*—Mediæval furniture, oak and painted; Renaissance; 16th and 17th centuries; modern.

MAR. 21.—LECTURE VII.—The Weaver's art; Mediæval, Eastern, modern.

The Lectures will begin on each evening at 8 o'clock.

The Christmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

CANTOR LECTURES.

FINE ARTS APPLIED TO INDUSTRY. BY W. BURGES, ESQ.

FIRST LECTURE, MONDAY, FEB. 8.—INTRODUCTORY.

MR. BURGES, after observing that the only way of exercising an influence on the progress of art was the application of it to objects made in great quantities for everyday use, and after adducing the example of the Greeks in this respect, proceeded to comment on the unwillingness in certain quarters to make a legitimate use of machinery, one great mission of which was defined as the reduction of pounds to shillings, and of shillings to pence. This prejudice was referred to a misunderstanding of the teaching of Mr. Ruskin and of the late Mr. Pugin, whereas the real object of these gentlemen was the discouragement of mechanical appliances to objects where life and variety were particularly wanted. After bringing forward some instances where, by a proper use of such appliances, really artistic objects might have been produced at a price exceedingly below their present cost, the lecturer proceeded to congratulate the English manufacturers on the great improvements manifested of late years. In support of this he quoted the opinion of M. le Comte Clement de Ris,

a gentleman sent over last year by the French Government to study the Soane Museum. M. de Ris advised "the French manufacturers, if they do not wish to find in 10 years time powerful rivals where hitherto they have only met humble tributaries, by no means to sleep upon their laurels." This progress was pronounced to be due to the general development of art, and, above all, to the Schools of Design and the admirable museum at South Kensington. The principal impediments to our future progress were then noticed, the most formidable of all being the want of a distinctive architecture. This affected all branches of design, inasmuch as the student had to learn half-a-dozen different styles and their various details, the consequence being that he mastered none of them thoroughly. Want of colour in our costume was then brought forward as another great impediment, the eye of the designer being naturally influenced by the colours he habitually saw around him. Lastly, the comparative great neglect of figure drawing was noticed as a deficiency very much to be lamented. The remedies for the present state of things, in the lecturer's opinion, were then enumerated. These were the extension of the Government schools of design, both in London and the provinces—the establishment of local museums, the contents of which should be periodically changed—the incorporation of the Mediæval department of the British Museum with the Kensington collection, and the subsequent removal of the whole to some central situation, say Charing-cross; and, above all, the bringing up a race of designers and artizans who should be, if possible, as well versed in the drawing of the human figure as those of the sixteenth century.

Ninth Ordinary Meeting.

Wednesday, February 10th, 1864; Lord Elcho, M.P., in the chair.

The following candidates were proposed for election as members of the Society:—

Cameron, Robert M., Canning-house, Edinburgh.
Defries, Daniel N., 5, Russell-place, Fitzroy-square, W.
Grant, Albert, Roseau-house, Addison-road, W.
Huntsman, Henry, 126, New Bond-street, W.
Kempton, Henry Tattersall Knowles, 17, Cavendish-place, W.
Travers, Archibald, 19, St. Swithin's-lane, E.C.
Westmacott, Percy, Whickham, Gateshead-on-Tyne.

The following candidates were balloted for and duly elected members of the Society:—

Goodliffe, Francis Gimber, Cecil-house, Cheshunt, Herts.
Goodyear, George Edward, Club Chambers, 15, Regent-street, S.W.
Grindley, Robert Dutton, Cambridge-lodge, South Fields, Wandsworth, S.W.
Kidd, John, 7, Wine Office-court, Fleet-street, E.C.
Offor, George, jun., 115, Leadenhall-street, E.C.
Walmsley, Henry Benjamin, The Elms, Acton, W.

The Paper read was—

ON FRESCO PAINTING AS A SUITABLE MODE OF MURAL DECORATION.

By J. Beavington Atkinson, Esq.

Twenty years ago the Royal Commissioners on the Fine Arts determined that fresco painting might be applied with advantage to the decoration of the Houses of Parliament. The benefits then promised from the adoption of the process have, either by fatality or fault, failed in realization. After labours extending well-nigh over a quarter of a century, the commission is dissolved, the frescoes are in decay, and a new method, imported from Germany has obtained the ascendancy. The frustration of hopes reasonably entertained, that in the revival of fresco painting a new and great era was about to dawn on our national arts, now comes as little less than a calamity on the country. It had been thought that a mode of mural painting which the practice of the greatest artists of the middle ages had proved to be durable, economical, and architectonic, might, with success, in these our modern times, be applied to the internal decoration of public and municipal buildings in the metropolis and provincial cities. I repeat that any disappointment of this well-grounded anticipation must be regarded by architects, painters, and art workmen as no less than a calamity, for it is manifest that if we allow a hostile verdict to be given against fresco painting, a large field which was open to an art development high in style and popular in the wide area of its teaching and appeal, becomes practically closed. I, for one, will rebel against any such fatal judgment. The hostile verdict, if verdict there be, has been founded on partial and insufficient evidence, and I think that good service will be done to the cause of noblest art by the attempt which I shall now proceed to make, to marshal concisely and clearly the facts of this fresco trial, just as they are. It will be seen that the experiment was not made in England until after mature deliberation. It will be shown that any failure or decay in the frescoes executed at Westminster is partial, and within the reach of remedy; and the conclusion, we believe, will come as irresistible, that the method which, in the hands of Raphael and Michael Angelo was the vehicle for the noblest thoughts, is still an art fitted for all time, in which the arm that is strong will rejoice, and the mind that is large must glory.

It is scarcely needful that the well-known process of fresco should be described. In order, however, the more clearly to comprehend the facts of the case as they at present stand, a short explanation may be desirable. I will call your attention, then, to three several important points in which frescoes contrast with oil painting and easel pictures. First, as to the material or surface upon which the artist works. Easel pictures are painted upon panel or canvas, the recipient surface being dry. In contrast, frescoes are painted on a wall, the surface of which is wet; hence the term fresco—fresh, or newly laid. This is the fresco *buono* or *puro*. However, the practise of the Italian masters admitted of certain latitude. A large composition, for example, might, in the first place, be laid down, in its breadth and simplicity, upon the mortar while moist, and then touched up and finished when dry by the secco or tempera process. And this liberty which the artists of the middle ages were permitted, ought, I think, to be, and indeed has been, extended to our modern practitioners. Accordingly, I I shall feel justified in using the term fresco in its more popular and extended sense—as a mural painting begun upon the mortar while wet, but oft-times elaborated and finished after the wall has become dry. This, and possibly other minor modifications, were in the original fresco eras of Italy, as in the modern and revived epoch in Europe, matters of personal convenience and nothing more. Certain artists, of sure and rapid hand, had found themselves, even in the first sweep of the brush, certain of the desired result, and hence their works would need no retouching. But other painters, more sensitive and timid, discovered that it was needful to revise their compositions, even as an author his proof-sheet prior to publication. By such retouching and revision, however, when kept within legitimate limits, the original thoughts and style of the painter or writer suffer no absolute reversion. In other words, the fresco, in its largeness of treatment, in its immunity from surface gloss or varnish, in its brilliancy and power to give off light, is scarcely to an appreciable extent prejudiced. But I think it is generally admitted, that the less of secco retouching the better; and I have no hesitation in saying that some of the frescoes in the Houses of Parliament have, by the inordinate laying on, probably both in fresco and secco, of opaque body colour, lost the transparency and the pure liquid

quality by which the lovely works of the best Italian masters are distinguished.

Easel pictures, as I have said, are on panel or canvas; fresco-paintings upon wall; and this difference in first foundation involves a corresponding contrast in the causes which secure durability or accelerate decay. Canvas may rot; worms eat away a panel; and not less does the mortar, in its constituents of sand and lime, become subject to chemical agencies which conspire for the picture's overthrow; and these agencies, which were not in abeyance in the middle ages, are of course active still. They have occasioned, as we shall see, the partial destruction of the frescoes at Westminster, as they had already wrought the demolition of like works in Italy. But this failure, when it overtook the painter of old, only served as a caution to greater care: never was it permitted to annul a method which in the hands of genius had been proved capable of grandest results. A like persistency in the pursuit of a noble end would well become our English artists.

I have first spoken of the material or surface upon which the fresco is painted. I would now secondly, in few words, direct your attention to a question no less vital—with what colours shall the fresco painter lay his palette?

Sir Joshua Reynolds said he was convinced the ancients were great colourists, because the colours they used were few and simple. The same argument might be adduced in favour of the Italian fresco painters. In fact, the multitude of pigments which are permissible in oils become greatly circumscribed in fresco. The conditions indeed which obtain in the processes of oil and of fresco are widely different. In mural paintings the colours sink into the mortar, and ought to be durable as the wall itself. In this amalgamation, however, they have to submit to a fiery test. The lime lays hold of the weaker sort and blanches their lustre; therefore is it necessary that unchanging earths and minerals should be chosen, that vegetable and animal dyes, however alluring, that artificial and compounded pigments which may be subject to decomposition, should be discarded. It is desirable, in short, that the fresco painter in simplicity should trust nature and not the colour-man, that he should take the earth from the ground and the mineral from the mine, just as the rains of heaven may have washed them, or the fire of the volcano may have tried them in the furnace; and the probability then is that the colours which have endured the heat and the cold, the wind and the rains of ages, will not vanish when handed over to the convent cloister or the palace hall. Nevertheless, some of the colours adopted by the middle-age painters, though wise in their generation, have gone, and some used by our modern artists have in like manner perished. This, in the nature of things, was to be expected. But such small misfortunes should, as we have said, impose greater vigilance, should nerve to effort, not enervate for defeat. A great art which has in past times been practised with signal success, must not be abandoned with the timid cry of surrender. For myself I do not join in the oft-repeated lament over the "lost arts." Assuredly with the manifold resources of science at our command, we can find more than an equivalent for all that has been lost. The fresco painter need not fear that materials will be wanting. No great art in the history of the world has become extinct from the lack of paints or brushes; but many strong and noble schools have perished from the incompetency of professors and from degeneracy in the taste of the people.

One more generic distinction of the art of fresco painting I would mention before passing to the specific experiments which have been made in this country. We have spoken of the mortar, wet or dry, which receives the picture. We have insisted on the simplicity of the pigments suited to the fresco process. And now, thirdly, we will say a word not on the material, but on the location, of these fresco paintings. Easel pictures, whether on canvas or panel, are moveable and itinerant; mural pictures are attached to the freehold, and are thus fixtures, and form part and parcel of the real estate. In the commerce of art, then, easel pictures may be deemed of the nature of goods and chattels; as personalty, which may pass from hand to hand; moveable stock, that can be put in transit from town to town, seeking house-room anywhere and everywhere. But fresco paintings, in contrast, as we have said, are inseparable from the freehold; they are heirlooms, which pertain to tenures and hereditaments; they are real property, which cannot be included in probate or touched by executor. And thus, in the commonalty of art, works executed in fresco stand in perpetuity as the heritage of ancient families; as a princely or noble lineage, they have taken hold of castle precincts, and abide from generation to generation. In hall and banqueting room they maintain a stately presence; tenants and retainers come and go, the flood of life passes by, but as long as the lordly palace lasts these memorials of ancient days depart not. And therefore has it always been held that, over and above the value which might inhere to easel painting, there was to fresco something superadded of paramount nobility. Fresco, as we have seen, is attached to the freehold, and consequently is inseparable from architecture, the earliest and the grandest of arts; and this, its indissoluble union with the stately art of construction, imposes severe conditions and qualifies for highest functions. These requirements and prerogatives I can now stop merely to indicate in fewest words. Suffice it to say, then, that fresco paintings, like the architecture which is their framework, should be simple in treatment, symmetric in proportion, broad in distribution of distinctive members and masses; that the theme chosen should have the element of greatness; that the truths embodied should be as enduring as the tenement they adorn; that details small, that thoughts trivial, and that methods meretricious, should find no place in that high and ancient art which Giotto, Orcagna, Signorelli, Michael Angelo, and Raphael, have raised to majesty and stamped with essential truth.

Such being the inherent dignity and worth of fresco, we cannot be surprised that the Royal Commissioners of Fine Arts, with the Prince Consort as their chief, should have deemed the adoption of the process as singularly suited to the decoration of great national buildings, a method, let me add, which could receive no more timely revival than at the period when architecture, taking to renewed development, craved from sculpture and painting consonant aid—a style which by its largeness and by the extent of its historic range seemed peculiarly fitted to impart to our English school a much needed power, mastery and grandeur.

Accordingly a trial of the ancient art of fresco was, as we all know, made under high auspices, in the Palace of Westminster. I have just closed a rapid survey of the process in general, and now proceed to the details of the actual experiment which has been made in this country.

In the year 1841, a select Committee was appointed by the House of Commons "to take into consideration the promotion of the Fine Arts in this country, in connection with the rebuilding of the Houses of Parliament." In this same year the Committee stated, in their printed report, that they had "obtained the opinions of some very distinguished professors and admirers of art, who were unanimous upon one point, viz., that so important and national a work as the erection of two Houses of Parliament afforded an opportunity, which ought not to be neglected, of encouraging, not only the higher, but every subordinate branch of Fine Art in this country." The Committee, writing more than twenty years ago, say that to one of the Fine Arts in particular, which indeed had scarcely been known in this country, they had directed special inquiry. "Fresco painting," they tell us, had then "lately been revived on the continent, and employed in the decoration of public buildings, especially at Munich." Sir Charles Eastlake, Mr. Dyce, and others, held

the opinion that fresco was to be preferred to oil, from its superior fitness to all situations, from its peculiar power of giving off light, and by virtue of its greater durability. It was further the judgment of the highest authorities that fresco paintings would greatly enhance the decorative beauty of the Houses of Parliament, and that the acquisition of the process, hitherto unknown to our artists, could scarcely fail to impart to the English school power in drawing, and grandeur in design and composition.

Accordingly, we cannot be surprised to learn from the report, presented to the House of Commons on June 18, 1841, that "your Committee having carefully considered the evidence, are disposed to recommend that the style of fresco painting should be adopted." In compliance with a further recommendation of the Committee, was inaugurated in the following year the Commission on the Fine Arts, appointed expressly to superintend the decoration of the Houses of Parliament, and to assist the Government in the conduct of all incidental investigations. The subsequent line of action taken by this imperial body will be within the memory of most of us. The Commissioners, in the first place, wisely determined to test the ability of our British artists by two successive competitions—one of cartoon drawings, the other of fresco paintings—the works executed being, it will be remembered, submitted to public scrutiny in Westminster Hall. The Commissioners in their third Report, dated Whitehall, July 9, 1844, humbly state to her Majesty that the exhibition referred to had taken place, and that, considering the inexperience even of the best artists in the practice of fresco-painting, they were satisfied with the promise of superior skill which had been afforded; and they were of opinion that several of the specimens of fresco-painting which had been so submitted to them, taken together with the cartoons before exhibited by the artists, or with other existing evidences of their talents, justified them in suggesting further measures, with a view to the execution of fresco-paintings in portions of the Palace of Westminster. Accordingly, we find, in 1845, the Commission for the first fresco in the House of Lords—the Baptism of Ethelbert—was entrusted to Mr. Dyce.

The Commissioners, it is worthy of remark, proceeded with commendable caution. Referring to their next report, dated 1846, we find them still apprehensive that want of experience on the part of British artists might involve the revived process in partial failure. "We have, however," write the Commissioners, "the satisfaction to state that the work entrusted to Mr. Dyce presents no evidence of such imperfections; that, on the contrary, it evinces great knowledge of fresco-painting and great skill in its application; that, further, as regards the effect of fresco-painting in the locality, we consider that it promises to agree well with the architectural and other decorations therein adopted or to be adopted. We therefore beg leave to confirm our former recommendation, and to propose that the remaining five compartments in the House of Lords shall be decorated with fresco-paintings when the several designs for the same shall have been approved." These five compartments were committed to Mr. Maclise, Mr. Cope, and Mr. Horsley; and the Commissioners, in their eighth report, dated 1848, give the following testimony in favour of the process they had sanctioned:—"We consider," write the Commissioners, "that the three works already executed, the designs for which had been before approved by us, are highly satisfactory as examples of fresco-painting; their effect confirms us in the opinion that, under certain circumstances of light and distance, fresco-painting is well calculated for the purpose of decoration; while from requiring the preparation of careful designs, the method recommends itself as being fitted to promote the study of form." The two remaining frescoes, completing the series in the House of Lords, were finished in the autumn of 1849, and "the execution of these frescoes," again write the Commissioners, "appears to us to be highly satisfactory, and to indicate increased skill on the part of the artists in the management of the material." In adducing these data I wish specially to note, first, that fresco-painting has been proved, to the actual experience of the Commissioners, suited to mural decoration; second, that the technical difficulties of the process had been so readily overcome, that even the first trial was to all outward appearance a success; and, third, that our English artists have shown themselves fairly competent to meet the conditions which the new method imposed.

The series of eight frescoes illustrative of the British poets, executed on the walls of the Upper Waiting Hall, must next obtain our consideration. It appears that the Commissioners, in 1845, were desirous of affording opportunities for the execution of cartoon designs, and for the further practice of fresco-painting, and that therefore they set apart this waiting hall for the display of tentative works. The painters selected for these labours were Mr. Cope, Mr. Watts, Mr. Herbert, Mr. Horsley, Mr. Tenniel, and Mr. Armitage, artists who had already distinguished themselves either in cartoon drawing or in fresco painting, at some one or more of the competitive exhibitions.

After the lapse of five years, when four of the eight illustrations of the British poets were complete, the Commissioners were able to pronounce that, "in all these works, evincing various powers in the artists, we recognise a satisfactory acquaintance with the method of fresco, and in some, abilities of the highest order." In 1854, "these experimental works" are reported as finished, and that apparently to the entire satisfaction of the Commission. I shall shortly return to these frescoes when I come to describe and to discuss the causes of their decay.

The only remaining series which it is needful to include in the present survey, are the historic pictures executed by Mr. E. M. Ward and Mr. Cope in the Commons' and the Peers' corridors. The Commissioners, in their thirteenth and concluding report, published last year, state that "Charles West Cope, R.A., who has undertaken the Peers' corridor, has prosecuted his work with equal ability and industry. Five out of the eight paintings of which the series is to consist have been already finished, and the designs for the remaining three have been approved by us. The Commons' corridor," continue the Commissioners, "consisting of the same number of compartments, has been allotted to Edward Matthew Ward, R.A., whose name is so highly distinguished by his able treatment of subjects from Modern History." It is well that we should, just in passing, note that in the pictures last put up in these corridors, the method of fresco has been abandoned for the new German process termed water-glass. Of the merits of this invention we have not time, at present, to speak. Suffice it to say, that the Commissioners, in this their preference for the new discovery, passed a tacit, though, perhaps, unintentional, censure upon the time-honoured process of fresco. From any stigma which may in consequence attach, it is our object now to exculpate this pure and noble art. Other methods may possibly be good. The more indeed that means can be multiplied whereby national and municipal buildings may be fittingly adorned, the better. I do not wish to utter one word to the prejudice of water-glass, in which, indeed, both at Berlin and at Westminster, the grandest works have been executed. Only let this be clearly understood that the merits of other methods, whatever be their name, can in no way invalidate the approved virtues of the ancient and well-tried Italian art. These virtues have been lauded throughout the entire earth. These excellencies have been extolled, as you have heard in the extracts read, by the Commissioners themselves. The reports of these Commissioners indeed are occupied, as you will have marked, with laborious eulogies on this middle-age process restored for modern use. Every fresco was, as we have learnt, when finished, made the theme for express jubilee. And, therefore, to the cloud of witnesses which for centuries have paid tribute to the fresco art, must we

add, last, though far from least, the Royal Commissioners of England.

We must now enter on the most difficult, not to say distressing portion of our subject, the decay of works which had entered upon a life so bright in promise. It is best, in the first place, that facts should simply be stated, without any conjecture as to causes.

We have spoken of three separate series of pictures, each to be found in a distinct locality. One group is in the House of Lords; a gallery of historic works runs along the corridors; thirdly, illustrations of the poets occupy the Upper Waiting Hall. These last have suffered most severely, and will therefore best serve as examples for the general description which I at once proceed to give. A close and detailed examination of these works will reveal distinct stages and probably different processes of decay. An early and premonitory symptom of disease would seem to be a blooming or frosting of the colours, which thus become as if mildewed. This affection extends, and hence the pigments undergo further change, and begin to fall from the surface of the plaster. Sometimes the process of disintegration would seem to have an external origin, possibly arising from the atmosphere. In other instances the agencies of destruction appear to be internal, dependent probably on the constitution and constituents of the mortar. Certain portions of the fresco are upheaved by some inner rebellious force, as if antipathies had sprung up between lime and sand and pigments. In this disruption, as in in the other phenomena of decay, several stages may be marked. The incipient traits of the distemper come in mitigated form. At first the fresco may give signs of dissolution simply by the colours having lost their fixity to the wall. The reds, the yellows, and the blues will come off when rubbed with the corner of a white pocket-handkerchief; spots or pimples may here and there be seen on the surface; these become aggravated into blotches, extending into confluent sores, so that the very tissues of the picture are eating and rotting away. Then it is that large blisters heave bloatingly on the arms, neck, and face of the figures, till at length the pictured forms peal off bodily, and fall as dust and ashes to the ground. Yet this destruction, though terrible just where it sets in, is far from universal. And this its essentially partial character we must in the present inquiry never for one moment forget. Partial effects point to like limitations in their causes; and causes which can be staid in their operation admit of counteraction. Most worthy, indeed, is it of remark that of two adjoining pictures, one shall have suffered ravages, while its neighbour shall be saved all but harmless. Furthermore, in the same fresco some colours have stood, while others have fled. In one picture, for instance, a blue dress remains firm, while a patch of brown close by has been dissipated. In another case, the light green sleeve of a woman's dress is peeling off to the thickness of cambric, while the body of the same dress, being painted with modified materials, lies hard to the wall. It is, then, I repeat, of great importance that we should mark that the decay is, after all, but partial in its extent. Yet, after making this fair concession, I am bound to say that of all the sad cases in which premature death has overtaken youth and beauty this is one of the most melancholy. In Italy I have known frescoes which have suffered cruelly from wind, rain, cold, and burning heat, or the reckless violence of man. Still they struggled on, and have survived for centuries. But these hapless offspring, cradled in an upper waiting-room, have barely entered on their teens; two decades are not complete since they saw the light. Surely we may well pause to ask by what fault this judgment has fallen on our labours.

The calamity which has overtaken the other frescoes in the Houses of Parliament is comparatively so inconsiderable that specific details are scarcely called for. In the House of Lords I noticed that some of the colours were loose on the wall, and in a few places there were indications of what may be termed mildew, with incidental eruptions and excoriations. All this, however, even in the aggregate, amounts to little. The injury to the frescoes in the corridors is still less. Indeed the only suspicious sign I detected in these works was the lax tenure of the body colours to the stucco; pigments which, probably having been added in distemper, are reduced to partial dissolution by the moisture of the atmosphere. Still I incline to think that in this or any other inquiry which may be instituted, it is more just—that is, more consonant with the actual facts—to throw all the frescoes in the Houses of Parliament in the same category. Some may have suffered heavily, others more lightly, even as, when an epidemic rages, certain patients die while others survive. Nevertheless I believe it will be found that the same seeds of decay are lurking in all the works, alike in their germs though greatly differing in their extent and virulence. The same lime, the same sand, and probably in great measure the same colours have been employed. The same atmosphere, charged with the products of combustion or with the refuse of human respiration, comes in contact with all the frescoes more or less alike; therefore I say, that the decay of these works is not so much a matter of the differing practice of individual artists, as it is the result of certain paramount conditions over which each painter had little or no control; and upon this I insist, in order to free the inquiry from all personal and invidious relations, and to reduce it directly to the strict limits of scientific investigation.

As to the precise causes of decay, little, unfortunately, is known. A Committee was appointed early in 1862, under the presidency of the First Commissioner of Works, to inquire into the condition of some of the frescoes. This Committee consisted of Sir Coutts Lindsay, Mr. Gambier Parry, the late Mr. Le Strange, Mr. Ruskin, and Dr. Hofmann. The paintings, not only in the Upper Waiting Hall, but throughout the building, were carefully and repeatedly inspected, and various artists and other competent witnesses examined. Yet, we are told, that the Committee "have not been able to arrive at any satisfactory result." Rough notes were taken of the proceedings, but no report has been issued, and the Committee is now defunct, leaving as the only record of its labours a well-considered letter from its chemist, Dr. Hofmann. "The general theory," says Dr. Hofmann, "of the fixation of the fresco assumes that the surface of the finished picture becomes coated with a pellicle of carbonate of lime, which protects the painting like a varnish. Carbonate of lime being practically insoluble in water, but soluble in water containing free carbonic acid," the question was naturally suggested whether the carbonic acid and water generated by the combustion of coal gas and by respiration might not have occasioned the deterioration of the paintings at Westminster. Accordingly, by way of experiment, a stream of water saturated with carbonic acid was allowed to run across the face of a fresco. We are told that after twenty-four hours the effect became very visible; that the colours grew paler and paler, and that, after the lapse of some days, the pigments were actually colourless. Dr. Hofmann proceeds to remark that, though he was not in a position to offer a definite opinion regarding the true cause of deterioration in the frescoes generally, he has yet been led to the belief "that the injuries are partly attributable to the fact of the surface of the wall having, in too many cases, been too long exposed to the action of the air, and thus become carbonated before the paint was put on. To use an intelligible, although not absolutely correct, mode of expressing it, the picture was put *upon* instead of *under* the protecting pellicle." This valuable letter, then, from Dr. Hofmann, which I shall proceed shortly to examine, is, I repeat, the only known result of the committee's labours.

This committee no longer exists; the Royal Commission itself is dissolved; the frescoes are allowed to proceed steadily in course of decay, and the only remedy taken is the abandonment of the process. This, the present state of the case, I deem, as I have already said, most di -

astrous. Discouragement has thus laid hold of professional men and the general public; and the progress of the arts I fear has thereby suffered material check. On the purely chemical causes of the decay, which we all deplore, I shall say nothing, partly because I am wanting in the needful knowledge, and also because the investigation which alone could give value to a judgment stretches far beyond the limits of private and individual labour. The subject is of public importance and moment, and ought to be undertaken on public grounds and at the general expense. I shall not attempt, then, to exhaust this question, which is indeed inexhaustible. One thing only I will do, which at this moment ought to be done promptly and positively: I will endeavour to prove to you that the reverse which has been sustained at Westminster should in no way militate against the further adoption of the fresco process, either in the metropolis or the country at large.

In the first place, it may be well that we should mitigate our surprise that these frescoes have decayed at all. It has been too much the fashion to hold the art as indestructible, as if indeed any art could be imperishable. Pictures of all kinds are endowed with constitutions proverbially sensitive, and the utmost that can be hoped for is that a stamina may be gained sufficiently robust to hold up in some degree against the ravages of time. But absolute immunity from decay is obviously unattainable. The mural paintings in Egypt, at Pompeii, and in the Baths of Titus, in Rome, have suffered injury; the mosaics in front of the Cathedral at Orvietto, and in the façade of St. Mark, in Venice, have fallen away and been restored; the panels and the canvas of oil pictures rot, and so in like manner it has been always known that the frescoes executed in the middle ages were amenable to specific agencies of destruction. Mrs. Merrifield, in her carefully-compiled volume, published eighteen years ago, has on this very point the following suggestive passage:—"The causes to which writers on painting commonly attribute the destruction of frescoes are damp, and the presence of salts in the substance of the wall, or the plastering or intonaco, or saline particles deposited on the paintings by the sirocco and other winds which blow over the sea; the injuries arising to the paintings from injurious attempts to repair them, entire neglect, or wilful injuries. Instances of the injuries to frescoes arising from damp are so numerous, that it is useless to enumerate them." Accordingly every traveller in Italy has to mourn over the decay or absolute destruction of multitudes of these works. That in England they should prove exempt can surely then be neither matter of surprise nor cause for discouragement. Historic evidence only justifies this expectation, that fresco-paintings, when executed with due circumspection, and when saved from unfair aggression, will endure as long as most other human creations. This assurance, which no existing facts materially contravene, is sufficient for all practical purposes.

That English artists and English patrons need feel but little discouragement from the failing of materials or the fault of climate, it is easy to show. We have already said that the fewer, the simpler, and the more natural the colours used, the better. The painters of the middle ages knew no royal road where pigments might be picked up ready for their use. The practice of these men was the growth of patient experience, their ultimate success was purchased at the cost of repeated failure. The materials they used are known to us, and lie within our reach, and modern science, to boot, brings to our aid far-searching eyes and wide-spreading hands. Any artist, then, who shall be heard to utter complaints against his materials may be at once put down with the workman who quarrels with his tools.

As to faults in the English climate, or the vicious elements in our town atmospheres, there has been more talk than the facts of the case warrant. I have suffered from cold and damp in the chapel of Giotto, in Padua, to an extent that could not possibly be experienced in the halls and corridors of Westminster. I have seen in Pisa, frescoes streaming with rain and condensed moisture; and yet some of the pictures executed by Benozzo Gozzoli, about the year 1450, are as fresh as if painted yesterday. In Munich, the centre of the German revival, the snow lies for three months of the year, and the streets are traversed by sledges. Furthermore, we should bear in mind that in Northern Italy and Southern Germany it has been deemed no madness to brave the bold experiment of fresco painting in the open air. In England we have ventured on no such rash attempt. All the mural paintings hitherto executed in London or the provinces have been safely housed. Our much-abused English climate, therefore, which is usually made responsible for the sins of its inhabitants, offers no absolute impediment to the practice of the fresco art.

In like manner the injurious effects ascribed to the noxious elements with which our city atmospheres are loaded have been greatly overrated. At all events, it may safely be asserted that the destruction of the frescoes in the Houses of Parliament is to no appreciable extent to be ascribed to such agencies. Dr. Hofmann, in the letter already quoted, proves by experiment that a picture may be bleached by pouring a "stream of water saturated with carbonic acid" across its surface. But most properly he appends the remark that "it can scarcely be admitted that the frescoes in the corridors of the House are exposed to anything like this severe test." And it is also most material to add that the actual injuries sustained have nothing whatever in common with the bleaching effects produced by Dr. Hofmann in the interesting experiment. That mural pictures, especially when painted in secco, or, to employ the graphic metaphor of the writer of the letter, when "put *upon* instead of *under* the protecting pellicle of carbonate of lime," are, to a certain limited extent, prejudiced by the obnoxious products of combustion and human respiration, cannot wholly be questioned. Yet the inquiries which have been from time to time instituted as to the injuries sustained by the pictures in the National Gallery and at South Kensington, show that the fears arising from these causes have been excessive. Sixteen colour tests, consisting of surfaces covered with white lead and fugitive vegetable or mineral colours, were hung up for the space of two years in various public institutions in the metropolis. It is satisfactory to know that these tests gave no indication of the action of gas, and the only chemical change that could be distinguished was to be ascribed chiefly to the want of ventilation. It is now generally admitted that the pictures in the National Gallery are exposed to no specific danger. Probably, indeed, these works have, in the earlier years of their existence, suffered more severely from the fumes of incense, the smoke of candles, and the close and affectionate approach of devotees, than from the not very insalubrious breezes of the river Thames.

The best, because the most practical answer, however, which can be given to these objections touching climate and populous towns, is in the simple fact that certain frescoes painted in the metropolis are still in a good state of preservation. I have, for example, carefully examined, with a powerful opera glass, Mr. Watts's fresco in the dining-hall of Lincoln's Inn, and find, with the exception of one or two square inches, that its vast extent of surface is still intact. Mr. Watts has shown me frescoes executed by him in Little Holland House; I have also seen rooms of a mansion in Carlton-terrace decorated by the same artist; and the colours in all these examples are just as fast as when first painted. Again, Mr. Armitage some years since painted a fresco in a chapel at Islington, and that, too, lies firm on the wall, and the colours are unchanged. Such instances are sufficient evidence of the practical knowledge of our English artists, of the soundness of materials at command, and of the benign temper of our English climate.

The interest of high art demands that some recognised authority should put an end to the present state of un-

certainty, so perplexing to painters and bewildering to the public at large. The manipulation of fresco is simple, and the conditions for ensuring its permanence cannot surely be difficult to discover. And yet, in the absence of any constituted tribunal entitled to pass a judgment, the entire question of mural decoration is left in doubt and confusion. The Royal Academy has never in these matters taken that lead which might have been reasonably expected. The Royal Commission, as we have seen, is dissolved; and yet there never was a time when knowledge and guidance were more needed. It strikes me forcibly that in this state of interregnum the Society of Arts could, with advantage, come to the rescue. A preliminary inquiry, entrusted to a joint committee of men of proved knowledge in science and art, might be instituted; a report, decisive in its facts and definite in its conclusions, should then, after due deliberation, be issued. But, in default of any such further and final investigation, advantage might be taken of the accumulated material locked up in Parliamentary Blue Books, and lying dormant in the scattered art-literature of the last twenty years. A "Handbook to Mural Decoration" could thus easily be compiled, which should give to the artist all needful information touching lime, sand, and the preparation of the mortar, together with well-authenticated facts relating to pigments, vehicles, and modes of execution. Such a guide would do much to prevent the recurrence of the blunders incident to inexperience.

Many of the practical and merely technical impediments being thus removed, the essential and artistic qualities of fresco would scarcely fail to win for it a way to extended adoption. England has happily within the last few years passed from the era of whitewash to an epoch of colour. In architectural form and composition the advance made during the same period is almost without precedent. The vast multitude, too, of buildings which have arisen in the land, churches, chapels, schools, clubs, railway stations, almost surpass calculation or belief. Who then shall venture to estimate the superficial area of wall space which is now ready to receive fresco decoration. One error, however, committed by our English artists has, it may be feared, materially impeded the general reception of these mural embellishments.

"I think," said Sir Coutts Lindsay, in his evidence before the recent Royal Academy Commission, "our artists in England have misunderstood the proper object of fresco painting. With a few exceptions, the frescoes that our artists have painted have been much too finished in detail, and much too little considered in the masses. They have painted them in the spirit in which they would paint easel pictures, the consequence is that they have cost them infinitely more time than they could afford to expend. Fresco painting has been a losing concern to every artist who has attempted it." Mr. Armitage has favoured me with a valuable letter to the same effect. Fresco ought not, writes Mr. Armitage, to be an imitation of oil painting. No rivalry should exist between the two branches; their objects are distinct, and so equally ought to be their modes of treatment. It is most important that the public should clearly understand that fresco, when executed broadly and simply, is an economic mode of decoration. A group of half a dozen figures, highly elaborated, after the manner of oil, might occupy a year and cost £1,000; the same group, pitched in a monochromatic key and painted broadly in fresco, could be executed in three months, at a quarter of the cost. "It is," says Mr. Armitage, "astonishing how effective a mere outline design filled in with flat tints and with the shades merely indicated, may be made, provided such outline be of a grand and impressive form." Mr. Armitage concludes his letter in these definite terms—"It would, therefore, be necessary before fresco could become general in the country, first, that the subjects selected for the decoration of buildings should be of a simple nature; secondly, that the execution should be broad and rapid; and thirdly, that the artist should be willing to sacrifice a portion of his accustomed remuneration in the service of a noble art, and for the honour of his country."

That the art of fresco is peculiarly noble, monumental, and architectonic, all authorities are agreed; that in its severe and stately forms it is peculiarly calculated to bring to our English school the discipline so much needed, all persons conversant with high and historic styles readily admit. The very difficulties of fresco, says Mr. Watts, are, in the present state of our English school, advantages. The necessity of a definite plan, of a fixed and firm outline; the need of architectural treatment, with its inherent symmetry and severity, all these are not disabilities but elements of power. Again, the demand for rapid execution renders simplicity imperative, and in simplicity is grandeur. These things considered, it is not surprising that many witnesses examined before the late Royal Academy Commission—Mr. Layard, Sir Coutts Lindsay, Mr. Watts, and others—look forward with confidence to the time when the historic deeds which have conferred honour on England shall shine forth upon the walls of our national buildings and municipal institutions; when the beauteous thoughts of our poets shall adorn our literary clubs; when the classic designs of Flaxman shall ennoble our public schools; and when the English mind, which has spoken through Shakespeare and Milton, and which responds to the choruses of Handel, shall obtain, through the noble art of fresco, worthy pictorial manifestation. In fine, that art which was so living and so abiding a reality for Italy, cannot remain, as at present, in practical England a mere illusive dream. The transient dishonour which we have suffered in the too speedy decay of the paintings at Westminster must be retrieved; and works, I trust, may shortly be executed in this country which will prove, like the grand frescoes of the middle ages, noble and enduring.

DISCUSSION.

Mr. Bishop remarked that on examining some paintings in Pompeii he had noticed an appearance which led him to the impression that the colours had been varnished over with wax, which was apparently absorbed into the mortar. With regard to modern frescoes, he thought it was very important that the mortar should be made of suitable materials. In one instance in Italy he observed the operator making mortar of Carrara marble; and at Naples, on one occasion, he saw them making lime from oyster shells.

Mr. C. H. Smith observed that, with respect to mortar, whether it was made of oyster shells, Carrara marble, or chalk, it mattered not. In each case lime was produced, with only a trifling addition of foreign matters.

Mr. R. N. Wornum wished to offer a remark or two upon the statement of Mr. Atkinson with reference to the alleged durability of fresco painting, as illustrated by the continental specimens to which he had referred. He believed that many of those pictures were not in reality pure frescoes, for true fresco painting was of a comparatively modern date, and many of the old oil paintings were of a date anterior to the frescoes. The Egyptians never painted in fresco; their pictures were all in tempera. The Romans and Greeks likewise never painted in fresco, though they used it for colouring their walls. All those nations painted their pictures in tempera. The plaster was very solid and hard, and the pigments were worked up with various materials, such as eggs, gum, and glue. The Egyptians used hippopotamus glue, and the Romans varnished their pictures with wax, which was burnt into the wall, and produced great durability. In the tempera pictures which had failed, the fresco colouring of the walls, which was the foundation of the picture, had not given way, but the pictures had fallen off, because they were not so thoroughly attached to the wall as the original fresco colouring was. With regard to the Italian frescoes, he believed there were but few specimens of the pure fresco extant; they were for the most part secco and tempera, and he be-

ieved it was only at Pisa that genuine old frescoes could be met with, the earliest of which were the production of Pietro d'Orvietto, dating at the close of the 14th century. Mr. Atkinson had dwelt upon the greater durability of fresco as compared with oil painting. That was not proved as yet, and certainly was not corroborated by the specimens of the art that were to be met with in many parts of Germany, particularly in Munich, where he (Mr. Wornum) resided 30 years ago, just about the period of the revival of fresco-painting; and on revisiting lately some of the most magnificent works executed at that time, he found that large patches had become destroyed. If it answered better in Italy he could only attribute it to the dryness of the climate, that of Germany having proved, in his opinion, unsuitable for this process of painting. There were in our National Gallery oil paintings of earlier date than most existing frescoes, many of them being still in a perfect state. With regard to the climate of this country there was not only the severity of the weather, but, particularly in London and larger cities, there were the smoke and dirt to contend against. In this country the surface of a picture must either be smooth, so as to allow of wiping, or else it must be protected by glass. It would not do to have a rough surface, because of the amount of dirt and soot that got into the crevices. It was far easier to keep an oil painting clean in this country than a fresco, inasmuch as the latter held more dirt, from its being of an uneven surface. The amount of dirt which accumulated from the atmosphere of the metropolis was something astonishing, and the pictures in the National Gallery, which were not protected by glass, required frequent wiping. For the reasons he had given, he thought fresco painting was not a system of mural decoration suitable for this country.

Mr. Armitage remarked that he knew of no better means of cleaning fresco pictures than rubbing them with stale bread, which removed the dirt most effectually. His fresco pictures in the Roman Catholic church at Islington, had not suffered in any way. He should like to hear any opinions with respect to the kind of sand to be employed. The so-called silver sand was used in the Palace of Westminster, and whilst he was at work upon one of the frescoes there, a German artist who was present objected to the use of this substance, and recommended that powdered granite should be used, as the only material that would render frescoes durable. If, however, the Munich frescoes had all failed, it did not argue much in favour of the superiority of granite sand. He had not gathered from Mr. Atkinson what he considered to be the chief cause of the decay of fresco pictures. The deterioration in the frescoes of the Houses of Parliament was very deplorable, but at the same time there were other frescoes in London where that decay had not taken place. No one, however, had yet explained why this had occurred in one place and not in another.

Mr. J. M. Blashfield said that during the early operations at the Houses of Parliament, some inquiries were instituted with respect to the lime to be used for the frescoes. He received specimens of some of the various kinds of lime, and he found one or two contained traces of peroxyde of iron; moreover, upon an examination of the existing frescoes at Westminster, he had come to the conclusion that the lime used in them must have contained a small quantity of iron. He knew also that silver sand contained a considerable quantity of iron, as he had used it very largely, and in some cases the quantity was so large that if the sand was placed over a fire it turned a pink colour. There were other qualities of sand which, before washing, looked dull and brown, but when washed and dried were very pure, and from such glass of excellent quality could be made. It was that sort of sand which he thought should be used for frescoes. The calcination of lime was a matter to which he thought too little attention had generally been given, and the sources from which the lime was derived also produced variations of quality. Some chalks contained from one to two per cent. of peroxyde of iron, whilst in others the proportion was very small. All chalks which contained iron formed lime more or less hydraulic; lime which was entirely free from iron had no hydraulic character, and would never set under water. It was, therefore, an important matter to those engaged in fresco-painting, that they should thoroughly understand the qualities of the lime they employed so as to produce the most durable work. The lime obtained from marble was somewhat porous when set. On examining a piece of mosaic from Pompeii, he was struck with the similarity between the fine mortar in which the small pieces of mosaic were imbedded and the ground of the frescoes there discovered. Both were porous, but very white and hard. It appeared to him that something like pumice or lava, partaking of the properties of the pozzolana of Italy, had been mixed with the materials, which had given a certain amount of porosity while it aided in the hardening of the lime, and formed the groundwork of the fresco, making it more ready to imbibe the colours. He had calcined Italian marble, and slacked it with great care; but it did not make a hard mortar. In his opinion, in most cases lime was not slacked properly for architectural purposes. When it was properly slacked and well kept, after four or five years it became so hard that it required great labour to bring it again into powder; but when carefully treated and laid on well with a proper quantity of sand, it would gradually dry without cracks, while new lime was sure to crack and blister. It was also most important that the bricks forming the wall should be well burnt, otherwise the salts left in them would be sure to find their way to the surface, and ultimately destroy the plaster. An instance had come under his own knowledge in which 20,000 bricks were burnt with only four tons of coals; whilst, in another case, no less than sixteen tons were consumed in burning 4,000 bricks. If the bricks were properly burnt, and if fine sand properly washed were used in the mortar, he had no doubt fresco pictures would possess the same durability in this country as that claimed for them in Italy.

Professor Kerr would venture to submit one other theory with regard to sand, which he believed was supported by the experience of very remote antiquity, viz., that the sand used should be stone-dust. Vitruvius, in describing the materials used in fresco, stated that the sand used was made by pounding stone rubbish. The effect of that might not be apparent at first sight, but on consideration it would be found to be an important point. The use of sand in plaster was this—it supplied the strength of the substance, the lime acting as the cementing medium, connecting the grains of sand together. But the lime which connected the grains of sand together was of itself a weak material, and liable to decay. It was simply carbonate of lime, divested of its carbonic acid by burning. Pure lime contained no carbonic acid, but if they mixed mortar with stone-dust, as was customary with masons for some descriptions of work—stone-dust instead of sand—the result was that the lime absorbed the carbonic acid in the stone-dust, when it became restored to its natural condition of carbonate of lime, and the process of hardening went on more rapidly. He thought these considerations were of importance as bearing upon the preparation of the ground-work for frescoes with a view to durability.

Mr. J. G. Crace said, although he was a great lover of fresco painting, yet, from all he had observed, he thought he must come to the conclusion that it would be a waste of valuable artistic time to continue to carry on the practice of that art in this country. In recent visits to Italy he had paid very particular attention to this subject, and had noticed that in many of the frescoes which were executed by early Italian masters some 400 years ago, the colours seemed to be perfectly fresh and the ground well preserved, but directly he quitted Italy and came into more uncongenial climates, he found that all works of this character that had been carried out for some great length of time, were more or less injured, and he thought it was only

under the influence of the peculiarly genial climate of Italy that fresco-painting could be carried on with safety. Of the paintings on walls exposed to the effects of the weather perhaps the most remarkable were those of the Palazzo Doria, at Genoa, executed nearly 400 years ago. The figures appeared perfectly fresh and beautiful, and in no way seemed to have lost the richness of the colouring, nor did the lime surface itself seem to have been acted upon. In those at Florence, which had been preserved by having been placed in the interior of the buildings, the colours seemed to be quite pure, fresh, and bright. He knew of no more beautiful example than that of Fra Angelico, which was but imperfectly represented in one of the chromo-lithographs exhibited this evening. It was most beautiful in colour and simple in design and execution. He did not, however, know, through the whole of the north of Germany, in Switzerland, or in Belgium, a single example of a well-preserved fresco existing. Of late years, he believed, that style of decoration had not been attempted. In Cologne Cathedral the results of its use were most melancholy. He would now say a word as to the various influences that were likely to injuriously affect any frescoes that might be executed in this country. First of all he would ask them to consider the external effects of our climate upon stone buildings. Look at St. Paul's or any other great building which had existed for any length of time in London, and see what were the effects of the climate upon them. If this were so on a plain, undecorated surface, how entirely would any painting with a variety of colours be destroyed. Then, again, there were influences operating behind the picture as well as on the front. If the lime were not well mixed, it would throw out an efflorescence which would cover the picture with a sort of mildew similar to the effects that were to be witnessed in the Houses of Parliament; and if the sand was not of the right description, the work was sure to be injuriously acted upon. The question then arose, why should we be bound to adopt fresco? He thought the step now taken by the artists employed upon the houses of Parliament was the right one, viz., the covering their pictures with a substance which produced a sort of vitreous surface not likely to be acted upon by our climate. The water-glass process no doubt possessed many valuable qualities, but the difficulty was to find a surface which the salt employed would combine with properly. He believed the only surface yet known which united intimately with water-glass, was simple whitening; a lump of whitening, which would crumble in the fingers, if dipped into a solution of silicate of potash became as hard as stone. As regarded encaustic painting, he thought the alternations of heat and cold of our climate would have a very prejudicial effect upon pictures executed in that style; and there was the further objection—that they could not cleanse wax paintings. Therefore, acknowledging as he did to the fullest extent, the beauty of the effects of mural painting, he felt that the great object to be attained was, to discover such a protective surface as would obviate the destructive influences which he thought at present precluded the employment of fresco in the arts of this country.

Mr. C. H. SMITH expressed his regret at what must be regarded as the unsuccessful results which had attended the fresco decorations at Westminster. With but few exceptions the same fate had attended the works of this character abroad. The picture of the "Last Supper," by Leonardo da Vinci, was almost entirely gone [Mr. PURDIE said that was an oil painting], and the same might be said of Raphael's beautiful ornamentations of the Vatican. The great objection to fresco, he thought, was its uncertainty—a small experiment might succeed whilst a large one might fail. Then there was the further objection—that real frescoes must always be copies from an original design. The artist could only prepare his materials for just as much work as he could accomplish in a day. Then, again, a pure fresco could not be re-touched, and he would ask, was it possible for any artist to paint a large picture satisfactorily piece by piece? It would scarcely happen but that he would desire to retouch certain parts and tone other parts differently; and besides, the effect of the colours when dry, was very different from that produced when they were first laid on. He did not agree with Mr. Atkinson in the opinion that valuable works of art should be attached to a building so as to be irremovable. We were fortunate in having in this country many pictures in oil of great value, which we could not have had if they had formed parts of mural decoration. He entirely concurred with the views expressed by Mr. Blashfield as to the effects produced by salts and alkalies in imperfectly burnt bricks, and also in many descriptions of building stone. When bricks of that description were used in the interior of buildings the effects were apparent upon the plaster, and the salts left in the imperfectly burnt bricks would penetrate through walls of great thickness. He thought this was the cause of the destruction of fresco more than anything else. The water glass process, he thought, had not as yet been sufficiently tried to warrant its general adoption.

Mr. PURDIE, as one who had made a considerable number of experiments with the various systems of fresco as well as with water-glass, begged to offer one or two remarks. Works of art like that referred to by Mr. Smith—the "Last Supper" of Leonardo da Vinci (which was an oil picture), painted upon walls, were subjected to two deteriorating influences, first, there was the condensation of vapours upon their surface, and secondly, there was the damp from the wall behind them; and the more impervious the surface of a picture was, the more liable it was to be affected by the damp from behind. The consequence was that in the instance alluded to, the damp from behind had carried away the surface of the picture. With regard to the various methods of fresco painting, Mr. Atkinson had described them as *buono* and *secco*, though the name of the latter was contradictory to fresco; then there was a third process, which might be termed the Pompeian fresco. It had been contended by one speaker that the Pompeian paintings were not frescoes; but from experiments he had recently had to make, he (Mr. Purdie) believed a great many of them were frescoes. The surface on which the pictures were painted was polished, but the picture itself was not so. It was supposed by some that the painting had been executed in wax, whilst others supposed it to be tempera. He forwarded a piece of the composition to the Museum of Geology, in Jermyn-street, and the result of analysis was that no trace of wax or other binding substance was found it it; there was nothing whatever but the pigment and carbonate of lime. The conclusion arrived at was that the picture was executed before the lime was dry. With respect to the issue raised by the paper, whether or not it was desirable to pursue the art of fresco painting further in this country, he would not, at that late hour, enter into that topic; but he would remark that whatever merit was claimed for frescoes was possessed in an equal, and even greater degree, by the water-glass process. That system had now been substituted for fresco by all the artists engaged in the Houses of Parliament with, he believed, the single exception of Mr. Dyce. The difficulties under which fresco decoration was carried out had been very aptly described by the last speaker, especially with regard to the difficulties of painting a picture in small portions from day to day. It was, indeed, very rarely that any artist could execute a satisfactory work under such circumstances. With regard to the fresco works of the old masters, he believed they had all been afterwards touched up in tempera. Reverting to the subject of water-glass, Mr. Purdie remarked that it was free from many of the practical difficulties which were at present inseparable from the fresco process; the whole ground-work was plastered over and allowed to dry before the colour was put upon it. The painting was executed with pure distilled water, and it was then covered, by means of a syringe, with a solution of silicate

of potash, which bound the colours to the surface. This appeared to him to be a remarkably simple process; and if the same effects could be produced as in frescoes, why should we continue to fight with difficulties, and why should we strive to attain by a mountainous path the point which might be gained by a level road? With regard to rendering frescoes permanent on exterior walls, he expressed his individual opinion that no attempt to effect this would be successful, and he confessed he viewed the external frescoes at Munich with anything but agreeable sensations. He hoped such effects would never be imitated in this country.

The Chairman said that before moving the vote of thanks to Mr. Atkinson, which he should do with the greatest pleasure, he wished to make a few observations. He was sure all present had derived the greatest satisfaction from the very able and lucid paper that gentleman had brought before them. When he was asked to take the chair on this occasion, he thought the best thing he could do was to endeavour to elicit the views of artists conversant with the subject, for what was really wanted was practical and technical knowledge on the process of fresco painting, and he believed he had gone to the very best sources for obtaining the most valuable information. He went in the first place to Mr. Watts, who sent him to Mr. Leighton, and subsequently to that he saw Mr. Herbert and Mr. Maclise; and he had before him letters from most of those gentlemen which would greatly interest those who had given attention to this subject. What they wanted to ascertain was, what was the proper material to be employed in this process and what was not. If he might venture to criticise anything which had fallen from Mr. Atkinson it would be this—that his paper showed a foregone conclusion in favour of fresco painting in its pure form, as practised by Giotto and the older Italian masters, and that the failures in this branch of art which had occurred in the Houses of Parliament ought not to induce us to abandon the exercise of the old process of fresco. Mr. Atkinson had pointed to the chromo-lithographic prints exhibited. These had been brought out by the Arundel Society, which had a good object in view, but if he had been in Mr. Atkinson's position—arguing in favour of frescoes—he would not have pointed to those prints, inasmuch as the object of the Arundel Society was to preserve to after ages some feeble record of those great masterpieces of early Italian art, the originals of which were mouldering and fading away. So far from appealing to these prints as evidence in favour of returning to a process which, Mr. Atkinson stated, had been abandoned by the artists employed by the Government, he (the chairman) would point to those chromo-lithographs as reasons for not rushing to the conclusion that we could not in the year 1864, find some better and more durable means of mural decoration. The tendency of the discussion was decidedly that fresco painting was unsuited for decoration in this country, but while they admitted that *fresco puro* was imperfect in itself, let them not on that account give up mural decoration altogether—he meant high art on their walls—till they were assured no good substitute had been discovered. He had before him a valuable little pamphlet by Mr. Gambier Perry, which showed that, while the most serious effects had been produced upon the frescoes at Mantua and other places where they existed in damp cloisters, yet in Egypt the colouring on the tombs of the Ptolemies was as fresh and bright as if only done yesterday. Whatever might be the merits of this process, however, it was clear from the experiments made in the Houses of Parliament that it was not suited to the climate of this country. But of this he was certain—they must not on that account be discouraged from attempting mural decorations in the highest style of art; and there were artists in England now who acknowledged that a fitting substitute had been found in the water-glass process, which was well suited to our climate. He had had a most interesting conversation with Mr. Herbert on this subject. That gentleman told him he had nearly been driven mad by the trouble and annoyance which the old system of fresco caused him. He added that he never knew how his work would turn out, the colours being put on while the plaster was wet, in which state it remained for about eight hours, and having finished a piece on one day he had to wait till the next to see whether it was correct. But, in addition to this, there was another element of difficulty, that if the plasterer put a little more water into the plaster one day than the day before, although Mr. Herbert might use the same colouring, when it was dry the effect would be quite different. Thus with respect to the small fresco of King Lear and Cordelia, which had stood the best (only one head having gone, owing to the uric acid from an adjoining room having trickled through and affected the colouring from the back) Mr. Herbert had cut out the head of Lear six times, and that of Cordelia five times, and there was no part of that picture which had not been cut out four times. From what he had said it was obvious that the plasterer must be as accurate in his work as the painter, and it sometimes happened that the painter and the plasterer were not on the best terms. It was a melancholy fact that Mr. Dyce's and Mr. Herbert's plasterers had each died mad—one raving mad and the other melancholy mad—and Mr. Herbert attributed this, in a great measure, to the effect of the constant worry those men were subjected to in their department of the process. He was gratified to find that Mr. Herbert expressed himself satisfied with the water-glass system. He had asked that gentleman to put upon paper his opinions generally on this subject, and he would now read the communication with which Mr. Herbert had favoured him:—

"I am quite convinced that however true the theory of fresco may be, the practice of it always has been, and will ever prove, next to an impossibility, if indeed any refinements or subtleties of art are attempted. I may be asked, have not the Italian painters left evidences to the contrary of this assertion? I reply, using the words of Vasari, that in his time there was but one "true fresco in Italy," and the melancholy condition of frescoes throughout the continent shows further proof of Vasari's statement. Almost all the really great colourists of Italy abandoned it after a few trials, and the Michael Angelos held up to us as marvels of fresco have long since been in a hopeless state of decay. The smallest work in genuine fresco, carried to any point of excellence without employing the fugitive mode of completion, *i.e.*, vinegar and white of egg (so freely used by Italian painters), would be an achievement only to be attained by successive obliterations and waste of life. Fresco may do admirably well where a slight bravura sort of art is required, but this should be the passe-temps for those whose aim is very moderate and whose employers are easily satisfied. Fresco has had a fair trial here, and is to give way before something a thousand times better in every way."

Mr. Maclise had written to him as follows on the subject of the water-glass process:—

"I beg leave to send you a proof of a report I made to the Royal Commissioners of Fine Arts, the late Prince having wished me to repair to Berlin to see the process and performance of the stereochromic method, as practiced by Kaulbach and others. You may not have leisure to look over the report, and therefore I must only ask you to receive the very latest intelligence on the subject of my daily practice. This practice with me is one of the utmost simplicity, I may say I have had a kind of pleasure in so simplifying it. On this fair tablet of forty-six feet of pure plaster, spread at once, I paint in colours ground with pure water, my only vehicle being distilled water, and this simple proceeding (being indeed the process of fresco secco) becomes nearly indelible by the mere fact of the colours being absorbed. This true water-colour painting (and what is called water-colour is in fact gum colour) becomes permanently fixed by shedding over it a spray of water glass through a syringe. The advantages of this method over that of fresco are obvious. The couch of plaster is spread at once over the whole surface, and not laid in piece by piece—each day's work to be painted on while fresh, to secure fixation. This old piece-meal process makes the work a kind of mosaic, and in a complicated design becomes a miracle of intricacy in

its joinings, and, although a misery to the painter, is a perfect triumph to the plasterer. In the new process we can proceed, if we like, with as much freedom as we approach a canvass, no cautious and cowardly preparation of sketches, and the cartoon to be punctured or styled on the wall and slavishly copied, whereby the vigour of the cartoon is lost, with nothing to compensate for it. As regards my own practice just now, I may reply to your inquiry, which is in itself a flattery, that although I have made a careful design of the subject to be painted in this place, yet I need not have done so, and as it is, I paint direct on the wall constantly from models of all sorts, sailors, marines, guns, tackle, ropes, blocks, and my hoarding is a kind of museum of marine stores, for which indeed I am originally indebted to your Lordship in having mediated for me, at my request, with the Secretary of the Admiralty, by whose favour I have secured attention at the War-office and stirred up all kinds of sympathies at Woolwich and Greenwich. To get Nelson's coat from its glass case in Greenwich Hall to my house at Chelsea, where I could do justice to the details of its buttons, required, I do believe, the intervention of the whole Board of Admiralty with the Governor. Dr. Hofmann said that the water glass spread over the picture ought to effloresce as a proof of its efficacy. I should prefer this not to take place; perhaps your Lordship may be able to learn something about it."

They had thus high testimonials in favour of the water-glass system, which it appeared had stood the test of a good many years. The examples of this process at Munich had stood while the frescoes had faded. The chairman then went on to state that he had received no written communication from Mr. Watts, than whom, however, no man had more enlarged views of art, or more devotion to fresco-painting. In proof of that, he might mention that Mr. Watts, during the time General Anson was Chairman of the London and North-Western Railway Company, offered to decorate in fresco the large hall at Euston Station, the company only bearing the expense of colours and the necessary scaffolding. That offer was not taken advantage of; but the liberal spirit of Mr. Watts met with a more ready response in the case of the hall of Lincoln's Inn, and when the work was done the Benchers were so struck with the handsome conduct of Mr. Watts that they voted him a sum of £500. No man had done more for fresco painting than Mr. Watts, and that gentleman had sent him to Mr. Leighton, for information with regard to the new process of mural decoration discovered by Mr. Gambier Parry, who, however, was not himself a painter, but had employed Mr. Leighton to execute the decorations of a church at Lyndhurst, in Hampshire. Mr. Parry had published a communication in the *Ecclesiologist*, and the extract he would read from it he believed would be interesting to the meeting—

"To meet all the requirements of wall-painting (where the walls are dry) with little risk of injury from the action of our climate, avoiding the objections to other systems, and retaining all that is good and effective in them, I recommend the following scheme. Take a medium composed in these proportions—

Pure bleached wax	3 ounces	by weight.
Elemi resin	1 „	
Oil of spike lavender	6 „	liquid measure.
Finest preparation of artist's copal	18 „	

which shall be used throughout from the first preparation of the wall to the last touch of colour laid upon it, that the whole mass may be perfectly homogeneous. All colours are to be ground up in it, and may be kept in tubes, as oil colours are, or in any other way. The same composition diluted in *twice its bulk* of rectified spirits of turpentine makes the liquid with which the pores of the wall are to be saturated by copious washes. The number of these washes must depend on the absorbency of the wall surface; and the more absorbent that be the better. The last wash should be mixed up with—

Best gilder's whiting well washed and baked dry.	3 parts *in bulk*, not in weight.
Flake white ground (as usual) in water and perfectly dry.	1 part, ditto.

to the consistency of thin cream; the surface should be well covered with it; indeed, in most cases, two coats of this are better than one. Common rough wall plaster will take two doses of the transparent wash, and two with the opaque white. Each wash should be allowed twenty-fours to evaporate. The object of these washes is to key the prepared surface deeply into the pores of the wall with a material which dries in them as hard as stone, and leaves a surface white, solid, absorbent, and of a good texture for painting. When the cartoon is traced on the wall, let a part of a design be chosen enough for a day's work, and washed over thinly with oil of spike or highly rectified turpentine, (the former is better, being a stronger solvent of the copal) the object being to open the surface which will then be painted into, and dry in one solid mass by the evaporation of the volatile oils. The wash should be lightly applied, before the palette and colours are prepared for the day's work; the time thus employed will allow the surface to dry just sufficiently to let the paint be applied without dragging up and mixing with it.

"The vehicle for painting in which the brush should be dipped must be either the same as the wall wash, only twice as much diluted, or oil of spike alone; or, when the cost of the spike oil is an objection, highly rectified turpentine. The surface dries gradually, not skinning over, as oil colours do, but equably throughout by evaporation."

On this subject Mr. Leighton had written to him as follows:—

"As I am, to the best of my belief, the only professional painter who has worked with Gambier Parry's spirit fresco, it may be convenient to you to refer to my unfinished works at Lyndhurst. I therefore send you two or three details which may interest your audience. The merits of the material are chiefly these:—Great similarity of result to buono fresco, which it approaches so nearly as to deceive anyone not conversant with the practice of painting. Great scope of colour, as it embraces the whole oil palette, and is not subjected to any of the limitations which are peculiar to fresco. Great facility of manipulation, admitting of washes, impasto, and glazing within the space of a very few hours. Little or no change in the drying, not more than in water-colour drawing, on absorbent sketching paper, Harding's, for instance. Facility of re-touching, as the surface is always soluble in spirit, though proof against water. The only point in which it is inferior to real fresco, is in the absence of that pure crystalline quality of light so peculiar to the latter. On the other hand, it has, in a great degree, that other quality of fresco, which is the Alpha and the Omega of all grand monumental work—gravity—dignity."

The Chairman added that he had ventured to call the attention of the meeting to these letters because they showed there were other means of painting, which artists of great distinction believed to be safe and satisfactory, and by means of which great works of art for decorative purposes might be executed without fear of decay. He thought the subject of such vast importance, that he hoped this meeting would give attention to the excellent suggestion of Mr. Atkinson, that some committee should be appointed to inquire into the subject. The committee appointed by the government had ceased their labours, but there still seemed to be so much doubt on this question, that it would be a pity that fresco painting should be abandoned without a full and fair inquiry. He would therefore enforce as far as he was able, the suggestion that this Society should appoint a good practical committee, in conjunction with the Institute of British Architects, the Royal Academy, and other bodies, who might go carefully into the subject. He concluded by moving a vote of thanks to Mr. Atkinson for his paper.

The vote of thanks was then passed.

Mr. ATKINSON said he was prevented by the lateness of the hour from making his reply. His review of the preceding discussion would be given in the form of a letter in the *Journal* of next week.

The paper was illustrated by cartoons and actual frescoes, executed by Mr. Armitage, and kindly lent by that gentleman; also by a selection of reproductions of frescoes in chromo-lithography, produced for the Arundel Society, as well as specimens of the various pigments and other materials employed in the process of fresco painting.

The Secretary announced that on Monday evening next, at 8 o'clock, Mr. Burges would deliver the second lecture of

his course, on "Art applied to Industry;" and that at the meeting on Wednesday evening next, a paper by Dr. Edward Smith, F.R.S., "On Public and Private Dietaries" (a sequel to the paper read on the 16th December last), would be read.

The following letter has been received:—

Sir,—Regarding frescoes and the materials used, a great deal might be said, even upon the Italian specimens and their decay; yet it is marvellous how long some have stood in exposed situations, where there is much damp, as in the valleys near the Swiss mountains, not that the climate there is like our humid one, where the lichens grow and decay so rapidly, eating their way into stone. Fresco, in England, can only be used for interior decoration, and even then the surface, so charming from its quality of not absorbing light, becomes deteriorated immediately by coal smoke, which it holds with great tenacity, making the mural pictures of the British artist —who gives more effects of light and shade than are to be found in Italian specimens—soon look black and dingy. As the Italian developed and used a material well suited to his climate, so ought the Englishman to find something better suited to his own—harder in surface, deeper, and impervious to damp, without glitter or absorption of light. The last and lowest school of art, the Dutch or Flemish, matured chiaroscuro, depending upon it for power; pigments on plaster they let alone, having a climate like ours. For colour and effect mosaic cannot compete with fresh fresco, though the former is well suited to our climate, being ten times as durable as the latter. Mosaic is not skin deep, and can be often cleaned without detriment. It has its drawbacks, but is capable of much grandeur and breadth of effect. The most enduring works of art in England are those of the Romans in mosaic—fresh and beautiful. If some one, conversant with the subject, would read a paper before the Society on mosaic as a mural decoration, he would confer an important benefit on the arts, and, perhaps, extend the use of a material well suited to any and every climate.—I am, &c., John Leighton.

Proceedings of Institutions.

Bradford Female Educational Institute (Yorkshire Union).—The annual meeting was held on the 29th January; Mr. Ald. Brown, the president, occupied the chair. The annual report says that during the past year the total number of members has been 559, against 493 in 1862. This increase has been chiefly in young women between the ages of twenty and twenty-five. The members comprised 210 weavers, 201 spinners and other factory workers, 95 nurse maids at home, 22 domestic servants, 10 dressmakers, 2 bonnet makers, 7 sewing-machine minders, 9 employed in shops, 2 French polishers, 1 piece-board paperer. Out of the 207 new members enrolled in 1863, 73 could neither read nor write, 42 could read and write very imperfectly, 57 could read moderately and write a little, 21 could read well and write moderately, 14 could read and write well, 170 had no idea of spelling, 115 knew nothing of arithmetic. Seven classes for elementary instruction had been in operation. The needlework classes were in a very satisfactory condition. The library exhibited a falling off in the number of volumes issued, as compared with the three previous years; the greatest decrease, however, being in works of a light character. The financial statement showed an income of £229 18s. 10d., and an expenditure of £217 8s. 11d.

Farnham Young Men's Association.—On the 29th ult. a lecture was delivered by the Rev. J. M. Sumner, M.A., Rector of Buriton, entitled "A Walk into Spain as far as Madrid." The Lord Bishop of Winchester presided. A vote of thanks was passed to the lecturer.

Faversham Institute.—Local Competitive Examinations have recently been held, at which prizes of books, varying in value from 20s. to 5s., were awarded in arithmetic, English grammar, composition, English history, reading, writing, and other subjects.

Gosport Literary Institution.—The Rev. E. L. Berthon, Vicar of Romsey, recently delivered a lecture on "The Sun." The chair was taken by Dr. Kealy, the president. The lecture was illustrated by diagrams of the subjects brought under the notice of the audience. At its conclusion, H. P. D. Cunningham, Esq., moved a vote of thanks, which was seconded by T. H. Field, Esq., and passed enthusiastically.

Leeds Mechanics' Institution.—The annual meeting was held on the 29th of January, Mr. Ald. Luccock, the president, in the chair. The report stated that all the departments of the Institution were in a satisfactory state, and that there was an increase of twenty-five members. During the year there had been 40,970 issues of bound books, and 3,797 of periodicals. Twenty-six lectures were delivered during the year; nine were on general literature and philosophy, nine on science, abstract and applied, and five on the drama and music. The attendance on all occasions was good. In the boys' school the number of pupils had increased from 162 to 188. In the examinations by the Universities of Oxford, Cambridge, and Durham, the Royal College of Surgeons, the Science and Art Department, and the Society of Arts, the results had been highly satisfactory. Nine were successful at the University of Oxford; of these, three obtained the title of Associate of Arts; twelve were successful at Durham; seven obtained the title of Literate of Durham; two were successful at the Royal College of Surgeons, and obtained the Diploma of Membership. The results of the examination of the Society of Arts have already been published. In the report of the Leeds School of Art it was stated that the numbers of pupils, of all classes, under instruction had been steadily increasing, and had risen from 3,166 in the year 1862 to 5,936 in 1863; whilst the attainments of the pupils, as tested in the public examinations, had increased in a still more favourable degree. The above number included 5,001 children of public schools; 587 pupils in middle class schools; 37 teachers and pupil teachers; and 348 students of the Central and Branch School of Art. During the past year two branch Schools of Art had been opened, under the same management and masters as the Leeds School. At the annual public examination of the pupils of the Leeds School, held by an Inspector of the Science and Art Department, at Leeds, Bradford, Huddersfield, Keighley, and Keswick, 601 pupils passed a successful examination. Twenty-nine medals were awarded to Leeds, six to Holbeck, and six to Keighley, making a total of 41; whilst the school also received a national medallion for mechanical drawing at the national competition in London, and one honourable mention for a chalk drawing from the cast; 15 students also passed the Society of Arts examination in freehand drawing, and obtained certificates. The plans for the new School of Art, in conjunction with the Mechanics' Institute, had been examined by the Science and Art Department, and, with the exception of a few trifling features, had been approved of. The account showed a balance in favour of the Institution of £250, the balance in favour of the new building being £2,288. Mr. T. Dawson mentioned some interesting facts as to the financial results of the operations of the various branches of the Institution during the year. Upon the Institute, distinct from the other departments, there was a loss of £74, but £42 of this was a loss upon catalogues. There was a profit of £17 on the girls' school, and £42 had also been expended in fitting up the new school-room, or the profit would have been larger. On the boys' school there was a profit of £106; whilst upon the School of Art there was a loss of £88, but £73 had been expended on desks, which would be available for the new building. The evening classes showed a profit of £4.

Manchester Mechanics' Institution. — A meeting was held here on the 20th January, to witness the distribution of the prizes and certificates awarded by the Society of Arts to the successful candidates at the last examination. The chair was taken by W. Fairbairn, Esq., LL.D., F.R.S., the president of the Institution, who expressed his satisfaction at the high position taken by the students of the Institution. The prizes were distributed by Sir J. C. D. Hay, Bart., who said he felt it to be a great honour to be permitted to present to the successful students the prizes which they had so well deserved. The very high character which those candidates had earned for themselves reflected the highest credit on their teachers, to whom the hearty thanks of every Englishman were due for the admirable manner in which they devoted their time, often almost gratuitously, to the education of others. The prizes which he was about to give to the successful would be in days to come objects which would rekindle feelings of fond attachment to the place where they had received their education, and would be marks of honour to be handed down to their families. The advantages generally which the country had gained from the bestowal of the prizes of the Society of Arts must be patent to all. The accuracy of thought required in the examination, by putting to the test of writing the knowledge of each competitor, and the impartiality of the examination, must be of the highest value to the students.

Marlborough Improvement Society.—A lecture was recently delivered by Mr Allen Curr, entitled, "The Sea—a Highway, a Battle Field, and a Grave."

Royston Institute.—The annual meeting was held on the 11th January. F. N. Fordham, Esq., in the chair. The report stated that at the last annual meeting considerable alterations were made in the subscriptions of the members, mainly with a view to the increase of the revenue of the Institute. The Committee think the result may be looked on as satisfactory. The income of the year, including a balance in hand at the commencement of £11 9s. 1d., amounted to £90 17s. 6d. The expenditure amounted to £89 4s. 3d.; thus leaving a balance in hand of £1 13s. 3d. The members in 1863 consisted of 31 life members, 6 honorary members, 45 ordinary members subscribing for reserved seats, and 104 ditto subscribing for non-reserved seats; total, 186—25 of these members also subscribed to the drawing classes. In 1862 there were 172 members and 57 subscribers to the lectures and reading-room. The financial result of the two years, so far as the sale of members' tickets and non-subscribers' tickets to lectures is concerned, was—in 1862, £57 9s. 5d.; in 1863, £68 19s. 1d. Twelve lectures and entertainments were given during the year, among which were one by Mr. H. Coxwell, on "His Scientific Ascents with Mr. Glaisher in his Mammoth Balloon;" one by Mr. Waterhouse Hawkins, on "The Gorilla, &c., contrasted with Man;" one by Mr. Basil Young, "Shadows on the Wall, or the Funny Side of Human Nature;" one (gratuitous) by the Rev. W. J. Beamont, M.A., on "Art, Artists, and Artisans;" one (gratuitous) by the Rev. T. R. Birks, M.A., on "Matter and Ether;" one by Elihu Burritt, on "The Physiology of Nations;" and one by George Dawson, on "Ill-used Men." The library has been increased by the addition of 63 volumes; 56 were purchased. The number of volumes issued during the year was 1,797. The most important step of the Committee during the year was that of union with the Cambridge School of Art, in the formation of classes for drawing, modelling, and painting. The Committee hope the number of the members of the drawing classes will increase, so that the fees paid will meet the demands of the Cambridge School of Art. At the recommendation of the Cambridge School, the Committee have decided on collecting a fund for the special expenses of this branch of the operations of the Institution.

Fine Arts.

The Statue of Her Majesty, to be erected at Aberdeen, and placed near that of the Prince Consort, is to be the work of Mr. B. Brodie.

Photographic Exhibition.—The forthcoming exhibition of the Photographic Society will be held in the Gallery of Female Artists in Pall Mall, and will open in the second week in May, closing in August. Members of the Society exhibit free of charge, but non-members will be charged a rent for space.

Wood-carving.—Mr. George Lock has addressed a letter to the *Building News*, in which he makes some suggestions for the more general application of this art to articles of every-day use. He regrets that "hitherto, in the department of artistic and carved toys, ornaments, and the articles of every-day use before enumerated, the French, Swiss, and Germans have, for taste and cheapness, maintained for centuries a pre-eminence," and expresses his belief that "the people of this country are in every way competent to execute what has hitherto been imported from abroad. If this were to be done, many thousands would be pleasurably and profitably employed in the production of carved works for the million. The efforts made to meet the competition and demand hitherto, have been solely of an individual character, rarely attended with even moderate success. This has resulted from the exceedingly contracted view taken of the matter, and the limited pecuniary and artistic resources brought to bear on the undertaking, which, had it been carried out in the same manner as some manufactures have, would, no doubt, have been equally as progressive and profitable as china and glass making, or metal working." He thinks "there can be no reason why, under proper guidance, large factories might not be solely occupied in the production, by children, of simple carved articles, whilst adults, male and female, might be separately employed in the production of the endless variety of goods which the present markets call forth from foreign establishments. With adequate funds, moderate-rented workshops in the metropolis or the provincial towns, first-class management as regards the subdivision and economic use of labour in adults and children, as is shown in the best-conducted mills, factories, and foundries, a first-class artistic staff to design and model the patterns with which to start, some experienced foremen or workmen from the factories and rural districts in which such a class of work has hitherto been produced abroad, with a few of the best English carvers accustomed to work for the commercial markets (like the knife-handle and bread-platter carvers of Sheffield, and the bog-oak jewellery carvers of Ireland), likewise some of the best-trained Parisian furniture carvers for the best kind of work, many hundreds of hands might be immediately taken into profitable training, and an impetus given to the art that it has yet never known in this country. Thousands of our own female peasantry have been taught straw-plaiting, lace-working, &c., which is carried on daily in the village homes of many counties, and much of the artistic toy-carvings now supplied to our shops from foreign parts might be produced by the same class of workers."

Manufactures.

ELECTRO-METALLURGY IN PARIS.

It has been said of Napoleon III. that, like the Roman Emperor, he found his capital of bricks and he left it marble; it may with truth be said that he found it of iron and will leave it of bronze. There is no feature in the recent improvements of Paris more remarkable than the substitution of the latter for the former metal, as far as the eye can judge, and it is impossible that a careful observer

should have passed across the beautiful Place de la Concorde, or Place Louvois, or along the principal streets and the Champs Elysées, without having noticed the change in the appearance of the fountains and the still greater one in the lamp-posts, or candelabra, during the last year or two.

The whole of the changes are due to the exertions of M. L. Oudry, the principal of the Usine Electro-Metallurgique d'Auteuil, seconded by the approbation of the Emperor and the aid of the Prefect of the Seine. The works in question are situated in the Route de Versailles, just beyond the bridge of Grenelle, and may be reached comfortably in a quarter of an hour by the American railway from the Place de la Concorde; and a foreigner making a proper application by letter would find little difficulty in obtaining admission. M. Oudry's productions include every kind of deposit with the aid of electro-galvanism, but his chief aim is the coating of objects in cast and wrought iron with a thick and proportionably durable deposit of copper. His experiments with this view commenced in 1854, and in the following year he was rewarded with a medal by the jury of the Universal Exhibition.

At this time he had only operated on wrought iron and small castings, and when he attempted to put his method into practice on a large scale he found that the presence of foreign substances and other peculiarities of cast iron gave him infinite difficulty. In fact, the same treatment which succeeded with wrought-iron articles totally failed in practice with those of cast metal. The mode at first tried by M. Oudry was to give the casting, after it had been very carefully cleaned, a thin coating of copper in a bath of cyanide of copper and potassium; but the coating thus obtained was not thick enough for practical purposes, therefore the objects were afterwards treated in a bath of sulphate of copper, and left under the influence of the voltaic action for periods varying from five to fifteen days. This plan answered admirably with small articles, such as spikes for ship-building, and screws, but failed completely when applied to large surfaces of cast-iron. Cavities which were not completely coated by the action of the first-named bath were immediately attacked by the strongly acidified-solution of the second; and this being the only kind of bath that M. Oudry had found capable of throwing down a thick deposit of copper on an iron surface, he was driven to the conclusion, after months of anxiety and a large expenditure of money, that the direct deposit of copper on iron was, if not impossible, at any rate impracticable. As an instance of the probation through which he had to toil, M. Oudry mentions a case of three iron chimney-pieces, over which he spent six months' time and 17,000 francs, and which he was obliged to abandon at last.

The method which he finally adopted was that of covering the castings with two solid coats of oil-colour and then dressing them over very carefully with plumbago; and with this system, and without any preliminary scraping or cleaning, he is enabled to obtain a coating of copper varying from one to two millimetres in thickness; the former, about one twenty-fifth of an inch, being considered sufficient for all ordinary purposes. The works at Auteuil have now been in full action since 1860, employing constantly from a hundred to a hundred and fifty workmen, and the results may be seen in any of the great thoroughfares of Paris, as, for instance, the now bronzed fountains of the Place de la Concorde, the Place Louvois, and the Champs Elysées, the large rostral columns and candelabra of the first-named place, and those around the Arc de Triomphe de l'Etoile, and eight or nine thousand lamp-posts, of a new and elegant pattern, to be seen on the boulevards and in the principal streets of the city. The consumption of sulphate of copper at this establishment is said to be about 3.500 tons per year. The two great fountains of the Place de la Concorde alone consumed 850 tons. As regards cost, the following are the figures furnished by M. Oudry: The new bronzed lamp-post adopted for the city of Paris is about nine feet high, weighs about 500 lbs., and costs 95 centimes the kilogramme, or about 4½d. per lb., when finished and mounted; total, nine pounds sterling; whereas a similar pillar in bronze, of half the weight, would cost about thirty pounds. The number of these pillars to be supplied for Paris alone is fifteen thousand, and the difference between their total cost in M. Oudry's bronzed iron and in true bronze is set down at £317,100.

M. Oudry does not confine his operations entirely to the coating of ornamental castings. He is now engaged in covering armour plates for vessels of the Imperial navy, with a deposit of copper the twelfth of an inch in thickness, and the small specimens exhibited certainly promise a very favourable result. He has also nearly executed one of the most remarkable galvanoplastic works yet performed, namely, the reproduction in copper of the bas-reliefs of Trajan's Column at Rome, from casts taken in plaster at the cost of the Emperor. This immense work is just completed, and consists of nearly five hundred pieces, presenting a surface of about seven hundred square yards. It is said to be the intention of the Emperor to have the whole arranged in sections, each about twelve or fifteen feet high, in the Museum of the Louvre.

M. Oudry's galvanoplastic works are very low in price as compared with the true bronze, but still they are not cheap enough for all purposes, and there is this difficulty, that the work cannot be done *in situ*. He has, therefore, invented another system, which deserves mention, as it has been applied, in many instances, in this and other towns. It consists in a new kind of bronze paint, composed of pure copper, thrown down by the galvanic process and afterwards reduced to an impalpable powder by means of steam stampers, in a vehicle having benzine for its basis. It is treated like ordinary paint, and the bronzed effects are produced by means of dressing with acidified solutions and powders composed of pure copper. A good instance of its application may be seen in the balconies of the Théâtre Français, which were thus painted about fifteen months since. It is difficult to distinguish at first sight this imitative work from M. Oudry's galvanoplastic coating, and it is calculated to last eight or ten years, while its cost is not a sixth of that of the other. The expense of painting one of the pillars already mentioned is about one pound, and three years' exposure in the open air does not seem to have produced any deterioration whatever in the appearance of the surface.

It should be mentioned that M. Oudry not only employs this benzine oil, or medium, in bronze painting, but in all his work, and has also introduced it into the trade as a substitute for linseed and other oils to which he declares it much superior, especially where there is danger from humidity, whether applied to metal, wood, stone, or plaster.

Commerce.

French Imports and Exports.—The official returns lately published by the Director-General of Customs relating to the imports and exports of France during the year 1863, show that the articles of which the importation has increased are raw hides and skins, wool, preserved meats, silk, tallow, guano, seeds for crushing, sugar, coffee, timber, woollen thread, and woollen cloth. The importation which has remained stationary refers to such articles as cheese, butter, olive oil, cocoa, dye stuffs, cabinet work, and flax. There is a diminution in dressed feathers, rice, corn, and, greatest of all, in coal. The value of the raw cotton imported into France in 1863 is estimated at 177,000,000f., against 126,000,000f. in 1862, and 270,000,000f. in 1861. English manufactured goods, which, according to the Protectionists, were to have driven all others out of the French markets, are becoming less every year. The cast metal imported into France

from England in 1862 was estimated at 22,000,000f., and in 1863 at only 18,000,000f. Iron in 1862, 22,889,000f.; in 1863, 4,709,000f. Cotton cloth in 1862, 14,000,000f.; in 1863, 7,926,000f. Woollen cloth in 1862, 40,961,000f.; in 1863, 32,091,000f. There has been an increase in the value of the following articles exported:—Wrought silk, woo len, cotton, linen and hempen cloth, woollen and flax en thread, dressed hides, edged tools, toys, books and engravings, paper and pasteboard, china and delf, millinery, wine, brandy, soap, sugar, fruit, eggs, corn, wool, dressed feathers, perfumery, and silk. There was a diminution in the exportation of chymical ingredients in 1863, though the duty on salt employed in their preparation was removed. The duty paid on the merchandise imported into France in 1861 amounted to 126,700,000f., in 1862 to 152,300,000f., and in 1863 to 166,200,000f. The most productive import duty is that on sugar; the next that on coal and coke. Next in succession come woollen cloth, cast metal, fruit, corn, linen cloth, cocoa, and machinery.

Sugar Statistics.—The production from all sources, including beet, for 1863, was about 1,900,000 tons, and it is thought that the aggregate deficiency for 1864 will not be less than 200,000 tons, or about ten per cent. on the total production. The recent accounts from the East show that large shipments are making at Mauritius for Bombay, and that the Chinese are drawing heavily on the Manilla crops. Still the stock in Jamaica continues in excess of previous years, being 192,000 tons against 154,000 tons in 1862, 130,000 in 1861, and 106,000 in 1860. The consumption is progressing satisfactorily, and there is a fair demand for export for both the Continent and America. The following tabular statement shows the export of sugars from producing countries in 1863, and probable production for 1864:—

	Tons, 1862-3.	Probable tons, 1863-4.
Cuba	450,000	420,000
Porto Rico	67,000	60,000
Brazil	115,000	85,000
French colonies	111,000	100,000
Dutch Antilles	18,000	18,000
British West Indies	195,000	115,000
East Indies	22,000	——
Mauritius	59,000	59,000
Java	99,000	95,000
Manilla	35,000	25,000
Louisiana	115,000	25,000
Beetroot produce:—		
France	144,000	130,000
Belgium	25,000	25,000
Zollverein	100,000	100,000
Russia and Austria	90,000	60,000

The deficiency being very considerable.

	Tons.
While the East Indies, instead of exporting, will import	20,000
Bombay and California will consume the more	20,000
England will increase her consumption owing to lower duties on tea, by about	20,000
Deficit in stock in France	3,000
Deficit in stock on the Continent	8,000
Loss by fire in the stores of Regia	12,000
Total	83,000

Messrs. Corrie and Co.'s circular says:—In our previous statement of the probable deficiency of some of the crops this year, the estimate of the falling off in Mauritius was put down as 30,000 tons; but subsequent advices from that island report the yield as not likely to exceed 100,000 tons in all, which is about 57,000 tons less than last year; and it is still expected that the production in Reunion will be 40,000 tons short. The quantity at present afloat to the United Kingdom from Mauritius is only about 7,000 tons against 17,000 last year, whilst from Manilla there are only 5,000 tons now on the way, against 24,000. The arrivals in Great Britain for the first month are very small, being nearly 20,000 tons less than the landings in January 1863. Deliveries for export shew an increase of 1,300 tons for the month, but for home consumption there is a diminution of 7,400 tons. The imports, however, being so small, there has been a considerable reduction in the stocks, and the quantity now in the warehouses is only about 11,000 tons in excess of the previous year, while in the chief continental ports the stocks are very much less than last year.

Metropolitan Railway Schemes, 1864.—The Board of Trade have just issued maps with a report on the proposed metropolitan railway schemes. In this report, after noticing that in eight out of 30 cases the standing orders have not been complied with, and remarking on the difficulty of grouping the various bills for apportionment between the committees of the two Houses, the board suggests that two select committees, one from each House, should meet in conference to consider together the matters referred to them, and, if possible, concur in a joint report. They notice that in none of the bills is there a provision for securing a month's public notice at the spot of the intention to take houses inhabited by the labouring classes. There is no scheme to create a central station, though the erection of several stations is proposed. The report enumerates the various schemes designed to meet the recommendations of the select committee of the House of Lords, that there should be a railway across the Thames on the eastern side of the metropolis, to connect the railways north and south; and that additional railway communication should be provided in the densely-populated parts of the metropolis, and a connection between the main lines, where not already in existence, should be established. The report states that these objects would be in a more complete manner effected by certain schemes designed for giving effect to the recommendation of the committee of an inner and outer circle of railway within the metropolitan district, communicating with the principal main lines of railway coming into the metropolis for distribution of the passenger traffic, the outer circle in its course intersecting and communicating with the principal lines of railway north of the Thames. For the outer circle, the Metropolitan District Railway seems well adapted to meet the views of the committee. The circuit may be taken as commencing at Battersea, by junctions with the London, Chatham, and Dover, and the London, Brighton, and South Coast Railway, whence it runs to the Thames, which it crosses at Chelsea by a bridge. It then proceeds to Brompton, where it joins the portion of this scheme called the inner circle, and throws out a branch to the West London Railway. From Brompton it proceeds through South Kensington and Kensington in a line parallel to Church-lane, close to which it crosses Notting-hill, and by Pembridge-gardens and Ledbury-road to near Kensal New Town, where it throws out branches to the Great Western and the Hammersmith and City Junction Railways. The line then proceeds through Kilburn, where it throws out branches to the London and North Western Railway, and a little further on, to the Midland and Hampstead Junction Railways, through Kentish Town, where it again throws out a branch to the Hampstead Junction, through Lower Holloway, where it throws out branches to the Great Northern, through Stoke Newington, where it throws out a branch to Stamford-hill, and through Clapton to Hackney-wick, where it throws out branches to the North London. From Hackney-wick it proceeds by Bow, where it joins the Great Eastern, to the Thames at Limehouse, which it crosses by an arch of 750ft. span, and 130ft. above high water in the centre. It then passses by the docks in Rotherhithe to the railways of the South Eastern and the London, Brighton, and South-Coast Companies in the neighbourhood of New-cross. The remainder of this outer circuit between New-cross and Wandsworth-road would be supplied by authorised lines of the London, Chatham, and Dover, and the London, Brighton, and South-Coast Railways. The

Metropolitan District Railways, besides forming the outer circuit just described, propose to construct an inner line, which, branching from the outer line at Brompton, and proceeding through Pimlico, passes near the Victoria Station, and then along the Thames embankment, passing near the Charing-cross Station to Blackfriars-bridge; thence near the intended Earl-street and Cannon-street Stations to Tower-hill, where it is designed to form a junction with the proposed extension of the Metropolitan line to that place. The remainder of this inner circuit would be supplied by the Metropolitan Railway, and its authorised extension to Finsbury-circus, and its extensions to Trinity-square, at the east, and to Notting-hill and Brompton at the west, proposed by the Metropolitan Railway, Notting-hill, and Brompton Extension, and the Metropolitan Railway, Trinity-square, Extension Bills. The portion of the Metropolitan District Railways just described takes the same or nearly the same course with a portion of the Metropolitan Grand Union, a line which, according to the deposited plan, seemed also to have been designed to meet the views of the committee by the formation of an inner circuit. This line would commence by a junction with the West London at Kensington, whence it proceeds in a subway to and under Sloane-square, and so on to near the Victoria Station. From the Victoria Station it runs nearly parallel with Victoria-street to Westminster-bridge, thence through the Thames embankment to Blackfriars-bridge, thence in a line lying to the south of Cannon-street, and passing near the Fenchurch-street Station to a point near the Metropolitan Railway at Finsbury-circus. The circle is then completed by the Metropolitan Railway, and its authorised extension to Finsbury with one exception. By the Metropolitan Grand Union Railway Bill branches are proposed to the London and Blackwall; the North London Extension at Liverpool-street; to the proposed extension of the Great Eastern line, a short distance north of Wormwood-street; to the lines at the Victoria Station, Pimlico, and from a point near Tower-hill to the South-Eastern and the Brighton Railways on the south side of the river, which is crossed by a bridge near the foot of Tower-hill. The Charing-cross Western and the Charing-cross Northern, taken in connection with each other, would in some degree serve the purposes of an inner circuit, by uniting the Charing-cross Railway with the West London Railway at Kensington, passing near the Victoria Station, Pimlico, at the west, with the termini of the Great Northern, the Midland, and the London and North-Western Railways at the north, as well as with the stations of the Metropolitan Railway. The connection so proposed with the City, instead of being formed by a line running along the Thames Embankment (north side), as in the case of the inner circuits previously mentioned, is effected by crossing the Thames at Lambeth, and then by means of the portion of the Charing-cross Railway on the south side of the river, and its extension across the Thames to Cannon-street. It has been strongly pressed on the consideration of the Board of Trade, by the Directors of the London and North-Western Railway Company, that the object aimed at in the suggestion by the Lords Committee for the construction of an outer circle of railways within the metropolitan district might be accomplished by means of the lines already constructed or authorised, if due facilities were afforded and arrangements made between the existing companies for that purpose; and they expressed their readiness to unite with all the necessary parties interested in the interchange of facilities, on equal terms, and in such arrangements as may conduce to the public convenience and the mutual advantage of the several companies. In this way it was urged the unnecessary expenditure of a large amount of capital might be spared, and the extreme inconvenience to which the whole neighbourhood is exposed during the construction of a metropolitan line might be avoided. After enumerating the schemes which would effect communication between railway termini, the report remarks upon those which would use new embankments or streets, block up those already in existence, or otherwise interrupt, temporarily or permanently, the street traffic. Great inconvenience would, no doubt, be caused to the occupants of houses in the streets interfered with. The Board suggest that some provision should be made to compel the removal of abandoned works, and that the deposit-money should be applied for that purpose, instead of being forfeited to the Crown. The Institution of British Architects have prepared a petition for presentation to Parliament, saying that they have observed with considerable alarm the schemes, nearly eighty in number, for constructing railways and other important works in the Metropolis and its neighbourhood, and pointing out that few of these projects have reference to the general and systematic improvement of the metropolitan lines of street communication, but are chiefly propositions for the junctions of certain lines of railways, originating in private enterprise for partial benefit. As no adequate street thoroughfare communications have been or are proposed, whereas it has long been felt by the commercial interests and the public in general, that the arterial communications through the Metropolis are no longer adequate, they desire the appointment of a Parliamentary Committee, or Royal Commission, to draw up a comprehensive plan for efficient and ample lines of street communication, and that the consideration of all the railway schemes proposed be deferred until such a plan shall have been determined upon. They suggest whether the railways in connection therewith might not be called upon to contribute towards the cost of carrying it into effect. The possibility of rendering these various projects conducive to the provision of suitable dwellings for the labouring classes, and affording them better access to more comfortable and healthy residences in lieu of those destroyed by such operations, as well as the doing away with all private bars or gates in the streets and the buying up all bridges, now held by companies or individuals, and throwing them open for public use, are also questions brought forward for the consideration of any Commission that might be appointed.

Colonies.

Tobacco Plants.—A Maitland paper states that mildew has recently made its appearance in the tobacco plants in some districts to a damaging extent.

Iron in New South Wales.—A bed of clay-iron ore has recently been discovered in the Illawarra district, between Balli and Coal Cliff. It lies horizontally embedded between sandstone; and the regular Wollongong coal measures lie a few hundred feet below it. The bed of iron ore is about twenty or thirty-five feet in thickness.

Coal.—A Sydney paper says, the coal-trade of the Hunter is likely to be considerably extended before long. A large firm have it in contemplation to extend their rail as far as Morpeth, and to put some screw colliers on the colonial line.

Silver in New South Wales.—It is reported that a rich silver mine has just been discovered in the vicinity of Reedy creek, at the base of the Dromedary mountain, about six miles west of the river. The exact locality is kept a secret until the ground has been secured.

Wine in Canada.—The culture of the grape and the manufacture of wine are becoming most important branches of industry, not only in the Western States of America, but also in Canada. In the vicinity of Hamilton they have been carried on to a considerable extent.

The Olive in South Australia.—The cultivation of the olive tree is receiving more attention here; it is considered that it ought to form a stated portion of the business of many of the farms. Rows of olive trees in the vineyards give useful shelter, and add to the returns. Many excellent examples already exist in the neighbourhood of Adelaide, and the oil produced is well fitted for consumption. The soil and the dry atmosphere of this colony

warrant the expectation of considerable success in the cultivation of the olive.

SOCIETY OF ARTS AT ADELAIDE.—The Committee of Management of this Society were to hold their Seventh Annual Exhibition in December last. The prizes offered this year by the Society were to be twenty-four in number, the highest being £6 6s. for the best oil painting, illustrative of an event in the history of South Australia. The subject was to be original, and painted by a resident in the colony.

THE BLACKS OF VICTORIA.—An interesting work on this subject has been written by Mr. James Borwick, formerly a resident in Adelaide. It consists principally of facts and theories respecting the Australian blacks, and contains a large amount of information. It describes their early history, physical appearance, character, intelligence, customs, superstitions, language, and several other subjects.

NEW PINE FOREST.—A Hobart-town paper speaks of the discovery of a new pine forest on the banks of the Forth. The timber is said to be of a very superior kind, and answers admirably for boards, into which that already procured has been principally sawn. The only drawback is, that there is no road to the forest, and that a dense scrub interposes between it and the place on which it would be desirable to have the timber sawn up and prepared for shipment. A tramway, or a cheap railway, is spoken of as the likeliest method of overcoming the difficulty.

WOOL.—A Hobart-town paper states that the "clip" of 1863 is magnificent in promise. It will be much above the average of anything known in the colony for many years past. For lambing, too, the season has been in the highest degree favourable. The drop will be fully fifty per cent. above that of 1862.

Publications Issued.

THE USEFUL METALS AND THEIR ALLOYS. *Houlston and Wright.* This work includes mining, ventilation, mining jurisprudence, and metallurgic chemistry employed in the conversion of iron, copper, tin, zinc, antimony, and lead ores; with their applications to the industrial arts. The chapters on metallurgic chemistry and assaying are by Dr. Scoffern. Those on mining, mining ventilation, and jurisprudence, were written for the work by a Government Inspector of mines. The chapters on iron and the several processes used in its conversion, have been prepared by Mr. Truran, C.E., author of the "History of British Iron Manufacture," and for many years engineer at the Dowlais, Hirwain, and Forest Iron Works under Sir John Guest and Mr. Crawshay. Mr. Clay, of the Mersey Iron and Steel Works, has described the processes and tools necessary for working malleable iron in large masses, including the details connected with the large wrought-iron gun presented to the nation by that company. The paper on steel manufacture is said to be by a gentleman of great practical experience, who wishes to remain unknown. Mr. Wm. Fairbairn, F.R.S., has contributed valuable information on the application of iron to the purposes of ordnance, machinery, bridges, and to house and ship-building. Mr. Vose Pickett has given a summary of his new system of iron architecture, a subject to which public attention has already been very considerably directed. The chapters on iron working for use and ornament, and the manipulation and construction of ornamental iron work, are by Mr. W. C. Aitkin, of the Cambridge Works, Birmingham. Those on copper, tin, zinc, and antimony, are by Mr. Oxland, of Plymouth, with the exception of the portions on copper and tin mining, which are partly by Mr. Truran, and partly by Mr. Oxland. The work contains numerous illustrations.

THE ART-STUDENT, an illustrated Monthly Magazine of the Fine and Industrial Arts, and Guide to their Principles and Practice. No. 1, February, 1864.—(*Hall, Smart, and Allen*). This new serial, of which the first number has just appeared, "aspires," as stated in its preface, "to a place in the studio of the amateur and professional artist, to proffer its aid in every branch of his studies, chronicle his progress, and afford him the means of communicating with his brethren; to unite and bring together students in every branch of the arts, and promote that spirit of friendly rivalry and mutual help which always results in so much real good to the classes and interests concerned."

Notes.

INTERNATIONAL EXHIBITION BUILDING.—It is stated that the contractors will have finished the building which is being erected in the Alexandra-park, at Muswell-hill, in March, 1865.

NAVAL ARCHITECTS' INSTITUTION.—The fourth annual congress of this Institution will be held on the 17th, 18th, and 19th of March, at the House of the Society of Arts. Two meetings will take place each day. Papers will be read on the "Principles of Naval Construction," on "Practical Ship-building," on "Steam Navigation," and on the "Equipment and Management of Ships for Merchandise and for War."

COPYRIGHT.—Early this session a Bill for the "Consolidation of the Acts relating to Literary Copyright," will be introduced by Mr. Adam Black, who has been devoting much attention to the subject during the vacation.

OPTICAL ILLUSIONS.—Mr. Manning, connected with the establishment of Carpenter and Westley, the well-known opticians of Regent-street, has perfected some ingenious arrangements, founded on the principle of the Dircks and Pepper's Ghost, by which effects of a novel and interesting character are produced, showing how completely the senses of sight and hearing may be deceived. The spectator is introduced into a dark room, when presently a curtain rises, and a vase of flowers appears, which cannot be distinguished from a real object until the operator, from behind, passes his hand through and through it, showing at once that it is a mere phantom. To render the illusion more perfect, a hand plucks a flower from the vase, and throws it on the floor. Punch and Judy next appear, the one a real puppet, the other a phantom, but utterly undistinguishable from each other. The well-known hard knocks are given and taken by both, and though the spectator well knows that there is deception in the sound as to one, at least, he still remains absolutely puzzled as to which is which. Punch in the end exhibits his phantom character by bowing his head to the ground and passing gradually through the floor, literally sinking into the earth. A hand now appears emerging from the darkness, takes up a piece of chalk, and writes on a slate hanging on the wall, in characters absolutely ineffaceable by the operator's hand, which is repeatedly rubbed over them, but which disappear when subjected to the same operation by the phantom hand. A variety of other illusions, which, like those above described, are most perfect in their deception, are given. The whole reflects great credit on the ingenuity of Mr. Manning, in turning to practical account the simple scientific and optical principles involved in the exhibition. It must be added that the exhibition is not got up for profit, nor is it open to the public, but is simply shown for the entertainment of the private friends of the firm, exemplifying what may be effected by the application of very simple means, and that "seeing" must not always be followed by "believing."

SCIENTIFIC RESEARCH.—A scientific expedition round the world for scientific research has been organised in Austria. The *Marco Polo* will leave Trieste, on the 5th of next March, with about sixty passengers, and the voyage is expected to extend over eight months. Two hundred days

will be spent on the sea, and fifty in visiting thirty ports which are named as stopping places on the route. The cost of the expedition is defrayed by the passengers, who pay £400 each. The ship has been carefully furnished with instruments and apparatus of all kinds, under the advice of the consuls of the different ports.

The Societe d'Encouragement.—The City of Paris has voted, out of the municipal funds, an annual grant of £240 to this body.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...British Architects, 8.
Medical, 8½. Dr. Edward Smith, F.R.S., "The Rate of Pulsation under the influence of numerous agencies in Health and Disease."
R. Asiatic, 3.
R. Academy, 8. Mr. R. Westmacott, R.A., "On Sculpture."
R. United Service Inst., 8½. Mr. H. D. Cunningham, R.N., "The Application of Steam Power to the Working of Heavy Guns."

Tues. ...Civil Engineers, 8. Mr. Thomas Sopwith, jun., "The Actual State of the Works on the Mont Cenis Tunnel, Victor Emmanuel Railway, and Description of the Machinery employed."
Statistical, 8. Mr. W. L. Sargant, "Some Defects and Results of the Registrar-General's Reports."
Anthropological, 8.
Pathological, 8.
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Experimental Optics."

Wed. ...Society of Arts, 8. Dr. Edward Smith, F.R.S., "On Public and Private Dietaries."
Meteorological, 7.
London Inst. 7.
R. Society of Literature, 4½.

Thur. ...Royal, 8½.
Antiquaries, 8.
Linnæan, 8. Mr. H. B. Brady, "On the Rhizopodal Fauna of the Shetlands."
Chemical, 8.
Numismatic, 7.
R. Society Club, 6.
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Experimental Optics."

Fri.......Geological, 1. Annual Meeting.
Philological, 8.
Royal Inst., 8. Mr. Wm. S. Savory, "On Dreaming and Somnambulism."
R. United Service Inst., 3. Capt. Arbuckle, "The Errors of the Rifle."

Sat. ...Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

Patents.

From Commissioners of Patents Journal, February 5th.

GRANTS OF PROVISIONAL PROTECTION.

Aerated liquids, stopping bottles of—225—J. H. Johnson.
Bags, &c., locks for—110—M. Wolfsky.
Barouches, &c., hinge for the heads of—209—A. McKenzie.
Boiler plates, shaping the edges of—3001—J. Fernie and G. Taylor.
Boots, &c., securing trouser straps to—135—E. Mainstone.
Bottles and casks, stoppers for, &c.—179—W. McAdam.
Bottles, jars, &c., closing—173—C. T. Woodman.
Boxes, fancy—185—B. Greenwood.
Brewing copper, steam—101—W. J. Murphy.
Brushes—157—J. G. Hinde.
Buffers—119—J. Gill.
Buttons, manufacture of—223—H. C. Huskinson.
Cannon—141—D. A. Burr.
Carbonates of soda, formation of—3131—E. Solvay.
Casks, &c., stands for—191—J. McElroy.
Chaff, roots, &c., machine for cutting—124—E. Whele.
Chlorine, manufacture of—5—W. Clark.
Cocks or taps—136—R. W. Sievier.
Corn dressing and winnowing machines—205—W. Tasker.
Cotton, &c., opening and carding—127—E. Lord.
Covering land, &c., with earth or soil, machinery for—126—W. Wood.
Cultivating, apparatus for—145—L. J. Cohen.
Curtain hooks—183—J. Edwards.
Daggers, adjusting to revolvers, &c.—130—H. A. Bonneville.
Drays—207—W. Tasker.
Elastic fabrics, ornamenting—103—J. Connell.
Engraving—71—H. A. Bonneville.
Feathers, sorting the down from, &c.—151—J. Hamer.
Fibrous materials, fixing colours on—152—T. Lightfoot, G. P. Barnes, and J. Lightfoot.
Fibrous materials, machinery for combing, &c.—111—W. Tongue.
Fire-arms, &c., tubes and barrels for—108—J. Thompson.
Fire-arms, &c., manufacture of—139—J. Thompson.
Fire-arms, bottles, &c., stopping muzzles of—106—J. Thompson.
Fire-places—128—E. B. Wilson.
Fodder-cutting machine—14—W. Clark.
Fortifications, &c., protection from projectiles—177—J. W. Walton, J. W. Walton, jun., and H. C. Walton.
Galvanic belt—112—A. F. Henery.
Gas lamps—121—W. C. Rogers.
Grain, seeds, &c., machinery for cleaning, &c.—175—J. Mitton.
Hand stamps, self-inking—113—W. E. Newton.
Healds, manufacture of—117—J. Ellis and J. Sladdin.
Heels for boots, &c., moveable and adjustable—102—J. Wadsworth.
Hydro-carbon oils, deodorizing—163—E. T. Jarrold and G. J. Yates.
Jewellery, &c., fastenings for—233—E. Atkins.
Lamps—219—R. Martindale and J. Williams.
Lamps, construction of—107—G. Burt.
Lamps or gas burners, attachment for—146—J. H. Johnson.
Lawn mowing machines—187—J. Shaw.
Lightning arresters—120—D. A. Burr.
Looms—1—J. Holden.
Looms, mechanism of—165—J. Burch and S. Fearnley.
Looms—221—J. Combe and J. H. Smallpage.
Metal, tool for enlarging holes in—155—J. Brown.
Money box—143—B. P. G. de Thorey.
Motive power, combined—125—J. J. S. Mountain.
Motive power, steam, &c.—150—G. T. De Kercado.
Mowing, &c., machinery for—213—A. Brown, L. G. Kniffen, and T. H. Dodge.
Musical instruments—134—W. H. Marks.
Packing for steam engines, pumps, &c.—132—H. Attwood.
Paper, cardboard, &c., ornamenting—197—T. Stevens.
Paper, process of bleaching—203—W. Ibotson.
Pigments, manufacture of—131—C. Vogt.
Piles, machinery for driving—115—L. Bovy.
Pneumatic pump—142—E. J. Vinot.
Projectiles, manufacture of—217—H. Bessemer.
Railway brakes—3083—J. Aubert.
Railway carriages, bearings for the axles of—133—C. A. Beckman.
Retorts and furnaces, for distillation of coal, &c.—109—J. E. Baker
Rivetting machine—123—A. Shanks.
Sack holders—154—J. Davies.
Shafting, &c., construction and lubrication of—116—C. Reynolds and J. Barrington.
Ships, apparatus for propelling—137—P. St. G. Græme.
Ships, combined iron and timber—118—P. Cato.
Ships, &c., steering—181—J. H. Johnson.
Steam boilers, furnaces for—199—J. E. Dix.
Stone, marble, &c., cutting and working—148—J. D. Jobin.
Sugar, sawing and cutting—144—R. A. Brooman.
Tablets, show-bills, &c.—2436—B. G. George.
Tanning machines—161—T. Bayley.
Tilling land, steam engines, &c., for—114—J. Howard, E. T. Bousfield, and J. Pinney.
Traction engines, &c.—201—W. Chapman.
Vehicles, apparatus for alighting from—231—S. Grafton.
Vessels, navigable—171—H. C. Bagot.
Vests, &c., knitted, manufacture of—147—C. Billson.
Washing, wringing, &c., machinery for—211—T. Bradford.
Window sashes, hanging, &c.—138—S. Wynn.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Ploughs, construction of—229—J. Gedge.

PATENTS SEALED.

1970. R. Dickson.	2663. W. E. Gedge.
1978. J. T. King.	2715. David Davy, jun.
1982. W. Clark.	2771. L. Barham.
2044. J. Broadley.	2836. G. T. Bousfield.
2080. R. Griffiths.	2837. T. Harrison.
2096. F. R. Stack.	2870. G. T. Bousfield.
2114. J. H. Johnson.	2924. W. E. Newton.
2250. W. Clark.	2967. L. Accarain.
2497. W. T. Bury.	2998. M. R. Pilon.
2577. T. Restell.	

From Commissioners of Patents Journal, February 9th.

PATENTS SEALED.

1884. J. W. Branford.	2010. R. B. Greenwood.
1976. W. Knowles and R. Halliwell.	2017. J. Wain.
	2018. W. Asbury.
1985. Sir J. S. Lillie.	2021. G. Yates.
1986. G. Graham.	2022. G. Davies.
1989. L. R. Bodmer.	2023. E. Scott.
1990. R. Canham.	2027. F. Flavell.
1991. J. Templeman.	2032. R. Lightbown.
1992. R. S. Newall.	2035. A. W. Parker.
1993. R. Wappenstein.	2037. A. M. Dearn.
1994. W. Hudson, C. Catlow, and J. Dodgeon.	2077. R. Thompson.
	2097. H. F. McKillop.
1995. R. S. Newall.	2113. D. Blake.
2008. C. Schiele.	2143. J. Dodge.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

451. C. Eyland.	333. C. While.
484. J. Howard and E. T. Bousfield.	331. J. Higgins and T. S. Whitworth.
315. T. Blezard and J. Blezard.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

331. P. Schafer and F. Schafer.	361. R. A. Brooman.
343. G. Wright.	

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, FEBRUARY 19, 1864. [No. 587. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

FEB. 24.—"On Petroleum, its Economic Value, and a Visit to the Petroleum Wells of Canada." By DR. MARCET, F.R.S.

MARCH 2.—"On the Verification of Olive Oil, by means of its Cohesion Figure." By CHARLES TOMLINSON, Esq., Lecturer on Science at King's College School.

MARCH 9.—"The Science of Fish-hatching." By Frank Buckland, Esq., M.A., F.Z.S., late 2nd Life Guards.

CANTOR LECTURES.

Courses of Lectures on the following subjects are arranged for the present Session:—

The Operation of the Present Laws of Naval Warfare on International Commerce. By G. W. HASTINGS, Esq., Barrister-at-Law (already delivered).

Fine Arts Applied to Industry. By W. BURGES, Esq.

Chemistry Applied to the Arts. By Dr. F. CRACE CALVERT, F.R.S.

The third lecture of Mr. Burges's course will be delivered on Monday next, the 22nd inst.:—

FEB. 22.—LECTURE III.—*Pottery.*—Etruscan vases (Wedgwood); Italian majolica (Minton); Sèvres china; modern biscuit.

FEB. 29.—LECTURE IV.—*Iron and Brass.*—Antique bronzes; Mediæval ditto; modern French bronzes (Barbédienne); Mediæval dinanderie; modern ditto (Hardman, Hart, &c.); Mediæval and Renaissance wrought iron; modern ditto; cast iron.

MAR. 7.—LECTURE V.—*Gold and Silver.*—Antique and Mediæval plate; modern ditto (Elkington); Antique and Mediæval jewellery; modern ditto; Antique and Mediæval coinage; modern ditto.

MAR. 14.—LECTURE VI.—*Furniture.*—Mediæval furniture, oak and painted; Renaissance; 16th and 17th centuries; modern.

MAR. 21.—LECTURE VII.—The Weaver's art; Mediæval, Eastern, modern.

The Lectures will begin on each evening at 8 o'clock.

INSTITUTIONS.

The following Institution has been received into Union since the last announcement:—

Banbury Science School.

The Christmas subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

CANTOR LECTURES.

FINE ARTS APPLIED TO INDUSTRY. BY W. BURGES, ESQ.

SECOND LECTURE, MONDAY, FEB. 15.—GLASS.

MR. BURGES, after explaining the true uses of antiquarian study, proceeded to give a description of antique glass. It appears that, so far from the old Greeks and Romans being ignorant of this material, they made vases in great quantities, which quite equal if not surpass what we produce in the present day. Thus, vases are found which are decorated with filagree ornaments, the crackle, gilding, stamping, &c., indeed, with every process which we are accustomed to consider the peculiar invention of the Venetians. The manufactures of these latter people were then described, beginning with the older examples, now so rare, and which sell at such marvellous prices. The date of these must be placed at the latter end of the 15th century, and they are, for the most part, blue and green, decorated with enamelled figures, and imitation jewels and gilding, applied in the most artistic manner. The other sorts of glass, more particularly the filagree and what is called the schmelz, were referred to and illustrated by specimens of the actual old work, for the most part kindly lent by Mr. John Webb. Modern glass manufacture was represented by some excellent examples from the manufactory of Messrs. Powell, Whitefriars. The next application of art to glass, touched upon by the lecturer, was its employment for stained glass windows. He first of all defined the various methods in which the mediæval workmen arranged their subjects, such as medallion, figure, and grisaille windows; and then, in order to show why it is so commonly asserted that the modern windows are not equal to the old, went into a history of the numerous improvements of the modern stained glass, principally brought about by the exertions of Mr. C. Winston. The third part of the lecture referred to glass mosaic and its modern revival. Attention was drawn more especially to the difficulty generally found in preparing the gold, which is placed between two thicknesses of glass, the lower one having ¼ of an inch in thickness, while the upper one is as thin as a hair. Dr. Salviati, however, appeared to have perfectly succeeded, his specimens, more especially those stamped into ornaments, obtaining a great deal of admiration. Mr. Burges concluded with a few words on enamelling, also a branch of glass making, but which, at present, appears to be but little employed except for watch faces and jewellery, although anciently a large trade was carried on in it at Limoges, to say nothing of the immense quantities produced in China during the two last centuries. Attention was called to the modern productions of Mr. Legoste, in which, by means of casting the

metal into the required cavities, instead of scooping them out, he is enabled to sell his works at a very reasonable rate. The table and walls of the room were covered with choice specimens of ancient Venetian and mediæval glass, besides some beautiful mosaics of Dr. Salviati and Mr. Fisher, and some excellent cartoons of stained glass, by Messrs. E. B. Jones and Holliday. The Society have also to thank Mr. Eastwood for the examples of ancient glass, Mr. John Webb, for the Venetian, and Mr. Wareham for an excellent collection of Chinese enamels; and some charming cartoons for stained glass were furnished through the kindness of Messrs. Lavers and Barraud, and Messrs. Powell, the latter having also supplied a fine collection of modern glass, suitable for every-day use.

Tenth Ordinary Meeting.

Wednesday, February 17th, 1864; Edwin Chadwick, Esq., C.B., in the chair.

The following candidates were proposed for election as members of the Society:—

Blackburn, Henry, 27, Victoria-street, S.W.
Smith, S. Pountney, The Limes, Shrewsbury.
Steele, Edwin Breare, Vauxhall-cottage, Parkhall-lane, Leeds.

The following candidates were balloted for and duly elected members of the Society:—

Bevan, Alfred, 11, Bryanston-square, W.
Bird, Thomas, 106, King-street, Manchester.
Busk, William, 28, Bessborough-gardens, Pimlico, S.W.
Greig, Robert R., 4, Verulam-buildings, Gray's-inn, W.C.
Henchy, Capt. Robert Cameron, Junior United Service Club, S.W.
Nunn, Richard M., Grays, Essex.

The Paper read was—

ON PRIVATE AND PUBLIC DIETARIES.

By Edward Smith, M.D., F.R.S, F.R.C.P., Assistant-Physician to the Hospital for Consumption, Brompton, &c.

Introductory.

The amount of nourishment which a people obtains must exert a large influence over the national character. An ill-fed nation can scarcely be a healthy one, and certainly it will be deficient in bodily strength and enterprise, whilst a sufficiently fed people, having these characteristics in a high degree, will be able to acquire wealth, which may be regarded as the material foundation for the stability of an empire and for influence among nations. Here I regard the sufficiency of food acting upon the masses of a population as the cause, not the consequence, of national greatness, but in the diffusion of the blessings which flow from wealth it may be expected that the consequence may in its turn react as a cause.

We have the happiness to be citizens of a country which equals, if it do not excel, any nation of ancient or modern times in the health and longevity of its people, the distribution of bodily vigour and mental energy, and the advantages of wealth with its attendant intelligence, comfort, and influence; and I have reason to believe that to this may be added the fundamental cause—the general abundance of food among the people. Yet it does not follow that these conditions have attained to their highest development, any more than that from them could be inferred the state of any section of the community or of any individual in a section. There is still doubtless need for progress in reference to the masses which constitute the nation, as there are, and always will be, multitudes who, in their individual relation, add little to the national wealth, and need the aid of others to procure the means whereby their own existence may be prolonged.

In the paper which I have now the honour to read to you, I hope to include both those who are sufficiently and those who are insufficiently fed—those who add to the wealth of, and those who are a burden to, society; and to show how the means of the one may be increased, and how the burden of the other may be lessened.

The principles which will guide me are to show in what way the largest amount of nutriment can be gained by those who have money to spend in private dietaries, and upon how little cost those may be supported who are fed by public dietaries.

The communication which I made to this Society two months ago, may be regarded as an introduction to the present one, since it gave the means of ascertaining the relation of the nutriment contained in various foods to a given cost, and it remains now to group together the cheaper foods in such a manner as will maintain health and meet the tastes of the people.

It was shown that the only practicable method of dealing with foods in relation to their nutritive value in a given dietary, is to ascertain the carbon and nitrogen contained in them, and estimate the cost of these elements at the market-price of the food. In reference to carbon, the cheapest foods were stated to be maize (or Indian corn), barley meal, rye meal, butter milk, peas, fresh vegetables (under certain conditions), oatmeal, bones, wheaten flour, and rice. As to nitrogen, the cheapest foods were butter milk, skimmed milk, peas, skimmed-milk cheese, maize, barley and rye meal, oatmeal, liver, fresh herrings, wheaten flour, fresh vegetables when cheap, dried herrings and bones. Maize, barley and rye, butter milk, peas, fresh vegetables when cheap, oatmeal, wheaten flour, and bones appear in both lists, and are therefore the cheapest foods.

On the other hand the following foods are the dearest in reference to carbon:—Tea, beef, new milk cheese, butter, dried herrings, mutton, skimmed milk (when dear), pork, fresh herrings, and new milk, and in reference to nitrogen:—Tea, dried bacon, green bacon, pork, mutton, new milk (when dear), beef, and potatoes (when dear). Tea, beef, mutton, pork, and new milk (when dear) appear in both lists.

The general result is to show that farinaceous foods and bones are the cheapest, whilst meats are the dearest; that milk and cheese occupy one or other list according to the cost of the different kinds, and that sugar and fats occupy a middle place.

When the hydrogen is calculated and reckoned as carbon the relative positions of some of the foods are slightly altered, but the extent of the change may be seen on reference to the column which I have added to the table which was printed in my paper on December 16, 1863.

Private Dietaries.

In proceeding to consider the private dietaries of the working classes, we must distinctly recognise the fact that some persons can only afford such foods as will maintain life, whilst others are able not only to do this, but consistently with it to please their appetites and select a larger proportion of the higher priced and luxurious foods. I am very desirous that this division should be borne in mind, for it is manifestly the first duty of a man to provide his family with sufficiency of nourishment, and, if necessary to do this, he should restrict them to dry bread, rather than limit the quantity of the bread by spending some portion of his money upon more costly foods. Inattention to this principle is, in fact, the radical source of error in the dietary of our lowest fed people, since they seek to obtain varied and sapid foods at the cost of insufficient quantity, and thus fall into disease; and it is to this class that the information which I desire to give is especially fitted.

This raises the question of the lowest amount and cost of food which is compatible with prolonged life and moderate health. It is a problem of complexity, both from the varying requirements of age, sex, and labour, and from the difference in the cost of foods in different

localities, but we may make an estimate which shall not be far from the truth in reference to the majority of cases. When desired by the Government to answer this question in reference to the Lancashire operatives, I stated that the quantity of carbon and nitrogen required daily by a man in middle life, in good health, and making a moderate amount of exertion (viz., exercise equivalent to standing 2½ hours, walking at the rate of two miles per hour during three hours, and at the rate of three miles per hour during one hour), was 4,300 grains of the former and 200 grains of the latter; and this I derived from numerous experiments, of which my own were by far the most extensive, showing the amount of these substances which are emitted from the body. We have no data so accurate and extensive with regard to women, but I was of opinion, from a consideration of all the known facts, that the diminution should not exceed 1-10th. This would give an average weekly requirement of 30,100 grains of carbon and 1,400 grains of nitrogen for men, 27,100 grains of carbon and 1,260 grains of nitrogen for women; and, when an average of equal numbers of both sexes was taken, 28,600 grains of carbon and 1,330 grains of nitrogen; and whilst I think this a sufficient quantity under the conditions named, it ought not to be reduced. The cost at which this could be furnished at the prices in the north of England, was 2s. for women and 2s. 4d. for men, but in order to err on the safe side, if err at all, and to meet the extra cost of foods in other parts of the country, I advised that the minimum allowance for food for the two sexes should be 2s. 3d. and 2s. 6d. respectively. When the dietary is intended for a family of different ages, the estimate must be of a more general character, and the nearest approach which I could make was to answer that a child over 12 years of age would eat as much as a woman, and that 2s. a week should be allowed for it, whilst under that age an average of 1s. 6d. per week would doubtless suffice to cover the cost of food.

This, then, is the basis which may be safely adopted both in public and private dietaries, with the exception of the cases in which the man makes more exertion than occurs in an ordinary trade, or where one member of the family is ill, and can only take the higher-priced foods.

I am precluded from quoting experience to support these estimates, but I may state that the information which will probably be published by the government in a few months will greatly add to our present knowledge. In reference to the operatives of Lancashire, I find that their average daily dietary during the existing depression, included 4,588 grains of carbon and 215 grains of nitrogen for men, and 3,758 grains of carbon and 155 grains of nitrogen for women, which, with an equal number of the two sexes, gave 4,173 grains of carbon and 185 grains of nitrogen. This is a little higher in carbon and lower in nitrogen than my estimate, and upon it we have abundant evidence that the health of this class of persons has not only been maintained but evidently improved.

Let us now see in what way the required nutriment may be produced at the price named. First, I will quote, from the tables issued by the government, the dietary of a few persons, to show how far their own experience has enabled them to do this.

No. 1. Male.—Carbon, 4,787 grains; nitrogen, 132 grains daily; cost 1s. 11½d. weekly. Bread, 10lbs.; sugar, 1lb.; butter, ¼lb.; and coffee, 2oz.; so that he lived on bread and butter and coffee.

No. 2. Male.—Carbon, 4,528 grains; nitrogen, 165 grains daily; cost 2s. 2d. weekly. Bread, 8lbs.; onions, 2lbs.; treacle, 1lb.; bacon, ½lb.; cheese, ½lb.; tea, ½oz. He ate bread and treacle, bread and bacon, bread and onions, bread and cheese, and tea without milk or sugar.

No. 3. Female.—Carbon, 3,801 grains; nitrogen, 164 grains daily; cost 1s. 9d. weekly, and out of 2s. allowed for food, saved 3d. weekly to redeem her clothes. Bread, 12lbs.; treacle, ½lb.; bacon, ¼lb.; 3 herrings, and coffee, 1oz. She obtained bacon or herring five days per week, with much bread, and coffee sweetened with treacle, and was well nourished.

No. 4. Female.—Carbon, 3,011 grains; nitrogen, 109 grains daily; cost 1s. 11¾d. weekly. Bread, 8lbs.; sugar, ½lb.; treacle, 1½lb.; bacon, 2 oz.; tea, 1 oz.; and coffee, 1oz. She lived on bread and treacle, tea and coffee, and bacon only on Sunday, and was ill nourished.

Case No. 5. Female.—Carbon, 3,777 grains; nitrogen, 165 grains daily; cost, 2s. 0¼d. weekly. Bread, 8lbs.; oatmeal, 1½lb.; treacle, 1lb.; bacon, ½lb.; meat, ½lb.; skimmed milk, 2 pints; and coffee, 1oz. She had meat or bacon daily, oatmeal porridge and treacle, or stirabout with treacle, bread and coffee sweetened with treacle. This was the best arrangement of food which I met with, and she was abundantly nourished.

Case No. 6. Female.—Carbon, 2,832 grains; nitrogen, 117 grains daily; cost, 1s. 10d. weekly. Bread, 8lbs.; sugar, ½lb.; treacle, 1lb.; bacon, ¼lb.; 1 herring; and tea, 2oz. This was an ill-arranged dietary, and she was ill-nourished.

Case No. 7. Female.—Carbon, 3,597 grains; nitrogen, 129 grains daily; cost, 2s. weekly. Bread, 8lbs.; potatoes, 5lbs.; sugar, ½lb.; treacle, ½lb.; butter, ¼lb.; bacon, ½lb.; and coffee, 2oz. She ate bacon three times a week, with potatoes, and bread and butter with tea and coffee, but was not well nourished.

Case No. 8. Female.—Carbon, 5,008 grains; nitrogen, 156 grains daily; cost, 2s. 2d. weekly. Bread, 8lbs.; oatmeal, ½lb.; treacle, 1¼lb.; skimmed milk, 3 pints; tea, 1oz.; and coffee, 2oz. She ate milk porridge, oatmeal pudding with treacle, bread and treacle, and tea and coffee, and obtained an abundance of carbon, but a deficiency of nitrogen.

Case No. 9. Female.—Carbon, 2,963 grains; nitrogen, 164 grains daily; cost, 2s. weekly. Bread, 6lbs.; oatmeal, 1lb.; sugar, ½lb.; bacon, ¼lb.; 4 herrings; buttermilk, 6 pints; and tea, 1oz. She obtained herrings or bacon five times a week, and buttermilk with oatmeal and bread daily, but owing to the small quantity of farinaceous food her dietary was deficient in carbon.

Case No. 10. Female.—Carbon, 3,351 grains; nitrogen, 136 grains daily; cost, 1s. 10d. weekly. Bread, 8lbs; oatmeal, 1½lbs.; sugar, ½lb.; treacle, ½lb.; butter, ¼lb.; and tea, ½oz. She lived on bread and butter and bread and treacle with tea, and oatmeal pudding with treacle, and had a dietary very deficient in nitrogen.

Case No. 11. Female.—Carbon, 3,405 grains; nitrogen, 129 grains daily; cost, 1s. 7¼d. weekly. Bread, 6lbs.; oatmeal, 2½lbs.; sugar, ½lb.; treacle, 1½lb.; butter, ¼lb.; and coffee, 1oz. She lived on bread and butter, oatmeal pudding and treacle, and coffee sweetened with treacle, and her diet was deficient in nitrogen.

The most economical dietary was that of case No. 3, at a cost of 3d. per day, and the selection made by case 5, at a cost of 3½d. per day, might be said to be luxurious; yet it is to be remarked that there was but little relation between the nutriment and the cost in the different dietaries, and in none was the quantity of nitrogen obtained equal to the standard.

In drawing up model dietaries I have endeavoured to obviate the defects now mentioned, and to meet the requirements of the system:—

1. By providing sufficient nourishment.
2. By selecting well-known foods.
3. By giving such variety as would permit the meals to be varied, and to correspond with that of the community, and particularly, whilst not permitting a deficiency of nourishment, to introduce almost daily some kind of meat for dinner.
4. By introducing fresh vegetables at a cost of 2d. per week.

The following are selected from those which cost from less than 3½d. to less than 4½d. per day, at the prices in the North of England:—

No. 1. Carbon, 4,004 grains; nitrogen, 201 grains daily; cost, 1s. 11¾d. weekly:—Bread, 9lbs.; oatmeal, 1lb.;

meat, ½lb.; bacon, ½lb.; skimmed milk, 3½ pints; buttermilk 3 pints; and vegetables 4lbs. This would give milk-porridge twice a day, with bread and vegetables daily and meat five times a week.

No. 2. Carbon, 4,122 grains; nitrogen, 207 grains daily; cost, 2s. weekly:—Bread, 8lb.; oatmeal, 1½lb.; treacle, ½lb.; bacon, ½lb.; 3 herrings; skimmed milk, 7 pints; and vegetables 4lbs.—This would give animal food and vegetables daily, with milk-porridge and oatmeal, pudding, and bread and treacle.

No. 3. Carbon, 4,249 grains; nitrogen, 184 grains daily; cost, 2s. 0½d. weekly:—Bread, 8lbs.; oatmeal, 2lbs.; sugar, ½lb.; treacle 1 lb.; meat ½lb.; skimmed milk, 7 pints; coffee, 2oz.; vegetables, 2lbs. This gives bread and treacle, oatmeal pudding and treacle, milk porridge, meat four times a week, and coffee daily, but by introducing more sugar and the coffee the proportionate amount of nitrogen is lessened.

No. 4. Carbon, 3,701 grains; nitrogen, 165 grains daily; cost, 2s. 1d. weekly:—Bread, 8lbs.; flour, ½lb.; sugar, ½lb.; dripping, 2oz.; meat, ½lb.; bacon, ½lb.; skimmed milk, 3½ pints; coffee, 2oz.; and vegetables, 4lbs. This will give meat and vegetables daily, with one or two plain puddings, bread and dripping, bread and milk, and coffee.

No. 5. Carbon, 3,937 grains; nitrogen, 208 grains daily; cost, 2s. 2d. weekly:—Bread 8lbs.; flour, 1 lb.; oatmeal, 1 lb.; sugar, ½lb.; dripping, 2oz.; suet, 2oz.; 3 herrings; liver, ½lb.; skimmed milk, 3½ pints; cheese, ½lb.; coffee, 2oz.; and vegetables, 2lbs. This would give three or four plain puddings with fat and milk, animal food four days, and cheese two days weekly, with vegetables daily, milk porridge, bread and coffee.

No. 6. Carbon, 4,793 grains; nitrogen, 200 grains daily; cost, 2s. 3½d. weekly:—Bread, 10lbs.; oatmeal, 1lb.; rice, 1lb.; sugar, ½lb.; treacle, ½lb.; dripping, ½lb.; skimmed milk, 3 pints; butter-milk, 4 pints; coffee, 2oz.; and vegetables, 4lbs. This excludes meat, but supplies much bread, with dripping or treacle, boiled rice or rice-pudding, with milk, vegetables, and dripping, milk-porridge and coffee. It is deficient in the comfort of the dinner, but the whole nourishment is ample.

No. 7. Carbon, 4,433 grains; nitrogen, 198 grains daily; cost, 2s. 4d. weekly:—Bread, 10lbs.; oatmeal, 1lb.; treacle, ½lb.; butter, ½lb.; meat, ½lb.; bacon, ½lb.; skimmed milk, 3½ pints; and vegetables, 3½lbs. This gives no coffee, much bread, with butter or treacle, oatmeal pudding with treacle, milk porridge, and meat five days weekly, with vegetables daily.

No. 8. Carbon, 4,991; nitrogen, 221 grains daily; cost, 2s. 4½d. weekly. Bread, 10lbs.; oatmeal, 2lbs.; treacle, ½lb.; meat, ½lb.; bacon, ½lb.; skimmed milk, 3½ pints; and vegetables, 4lbs. This is an excessive dietary, and differs from the last only in supplying meat daily, and offering more oatmeal pudding.

No. 9. Carbon, 4,434 grains; nitrogen, 210 grains daily: cost, 2s. 4½d. weekly. Bread, 8lbs.; oatmeal, 2lbs.; sugar, ½lb.; treacle, 1lb.; skimmed milk, 3½ pints; buttermilk, 3 pints; coffee, 2oz.; bacon, 1lb.; and vegetables, 4lb. This would give bacon, vegetables, and bread daily, with oatmeal pudding and treacle, milk porridge, and coffee.

No. 10. Carbon, 4,714 grains; nitrogen, 265 grains daily; cost, 2s. 6d. weekly. Bread, 8lbs.; oatmeal, 2lbs.; peas, 1 pint; sugar, ½lb.; treacle, ½lb.; butter, 2oz.; 4 herrings; bacon, ½lb.; liver, ½lb.; skimmed milk, 6 pints; coffee, 1 oz.; and vegetables, 2lbs. This is an excessive dietary, and particularly in nitrogen. It supplies animal food six or seven days in the form of liver and bacon, with boiled peas pudding, or herring, and vegetables, oatmeal pudding, with treacle, milk porridge, coffee, bread and butter, and treacle.

Such are examples of how much nutriment may be obtained from food to which the people are accustomed, and offering three meals a day with the usual variety, and usually including 2oz. of some kind of meat, at a cost up to 4¼d. per day. The articles selected are the cheapest farinaceous foods, American bacon, which is the cheapest fat, and skimmed milk, whilst sparing use has been made of butchers' meat, sugars, and the dearer fats.

Let us now look at the subject in another, and to my mind more satisfactory light, and ascertain how much nutriment can be afforded at a meal for sums not exceeding 1½d. for breakfast, 2d. for dinner, and 1d. for tea or supper, or a total cost not exceeding 4½d. per day. For this purpose I will again turn to the dietaries which I have prepared for the Government, and in order to apportion the daily nutriment to the wants of the system at the period of the three meals, I will state that the amount of carbon required is 1,500 grains at breakfast, 1,800 grains at dinner, and 1,000 grains at supper, whilst that of nitrogen required at those meals is 70 grains, 90 grains, and 40 grains, respectively.

Breakfast.

No 1.—Oatmeal brose. Carbon, 1,397 grains; nitrogen, 74 grains; cost, 1d. Oatmeal, 6oz.; treacle, 1oz.; skimmed milk, ½ pint; water, ¼ pint.

No. 2.—Milk porridge. Carbon, 1,300 grains; nitrogen, 77 grains; cost, 1½d. Skimmed milk, 1 pint; oatmeal, 2oz.; bread, 3oz.; fat, ½oz.

No. 3.—Milk porridge. Carbon, 1,478 grains; nitrogen, 80 grains; cost 1½d. Skimmed milk, ¾ pint; oatmeal, 2 oz.; bread, 5½ oz.; fat, ½ oz.; water, ½ pint.

No. 4.—Milk porridge and bacon. Carbon, 1,564 grains; nitrogen, 69 grains; cost, 1½d. Skimmed milk, ½ pint; oatmeal, 1½ oz.; water, ½ pint; bread, 4 oz.; bacon, 2 oz.

No. 5.—Rice, milk, and bread. Carbon, 1,551 grains; nitrogen, 75 grains; cost, 1½d. Rice, 2 oz.; skimmed milk, 1 pint; treacle, 1 oz.; spice; fat, ½ oz.; bread, 4 oz.

No. 6.—Coffee, bread, and butter. Carbon, 1,190 grains; nitrogen, 56 grains; cost, 1½d. Coffee and chickory, ⅛ oz.; skimmed milk, ½ pint; sugar, ½ oz.; water, ½ pint; bread, 6 oz.; butter, ½ oz.

No. 7.—Coffee, bread, and bacon.—Carbon, 1,528 grains; nitrogen, 58 grains; cost, 1⅝d. Coffee, ⅛ oz.; skimmed milk, ¼ pint; sugar, ½ oz.; water, ½ pint; bread, 6 oz.; bacon, 2 oz.

No. 8.—Oatmeal brose, bread and bacon. Carbon, 1,990 grains; nitrogen, 88 grains; cost, 1½d. Oatmeal, 5 oz.; treacle, 1 oz.; skimmed milk, ½ pint; water, ¼ pint; bread, 3 oz.; bacon, 1 oz.

No. 9.—Rice milk, bread, and bacon.—Carbon, 1,889 grains; nitrogen, 76 grains; cost, 1½d. Rice, 2 oz.; Skimmed milk, ¾ pint; treacle, 1 oz.; water, ⅛ pint; bread, 4 oz.; bacon, 2 oz.

No. 10.—Tea, bread, and butter. Carbon, 1,081 grains; nitrogen, 46 grains; cost, 1½d. Tea, ⅛ oz.; sugar, ½ oz.; skimmed milk, ¼ pint; water, ½ pint; bread, 6 oz.; butter, ½ oz.

Nos. 8 and 9 show, in a striking manner, the amount of nutriment which can be obtained from the cheaper farinaceous foods, cheap milk and cheap fat, whilst the contrast between them and Nos. 6 and 10 show how wasteful is the expenditure upon the dietary when tea and coffee are introduced. With the two last-mentioned exceptions the quantity of nitrogen is universally sufficient.

Dinner.

No. 1.—Bread and cheese. Carbon, 1,150 grains; nitrogen, 66 grains; cost, 1½d. Bread, 8 oz.; cheese, 1 oz.

No. 2.—Suet pudding, bread, and cheese. Carbon, 1,496 grains; nitrogen, 74 grains; cost, 1½d. Flour, 4 oz.; Suet, ½ oz.; skimmed milk, ¼ pint; bread, 4 oz.; cheese, ½ oz.

No. 3.—Rice pudding, bread, and cheese. Carbon, 1,673 grains; nitrogen, 83 grains; cost, 1¾d. Rice, 3 oz.; skimmed milk, 1 pint; suet, ½ oz.; sugar, ¾ oz.; spice and salt; bread, 3 oz.; cheese, ½ oz.

No. 4.—Fish. Carbon, 1,387 grains; nitrogen, 101 grains; cost, 1¾d. Fresh herrings, 9 oz. (2); dripping, ½ oz.; potatoes, 8 oz.; bread, 3 oz.

No. 5.—Bacon, vegetables, and cheese. Carbon, 1,843

grains; nitrogen, 69 grains; cost, 1¾d. Bacon, 4 oz.; potatoes, 8 oz.; bread, 4 oz.; cheese, ½ oz.

6.—Meat, pudding, and bread. Carbon, 1,616 grains; nitrogen, 71 grains; cost, 2d. Flour, 4 oz.; suet, ¾ oz.; meat, 3 oz.; bread, 2 oz.; potatoes, 5 oz.

7.—Liver, pudding, and bread. Carbon, 1,734 grains; nitrogen, 100 grains; cost, 2d. Flour, 4 oz.; suet, ¾ oz.; liver, 4 oz.; bacon, 1 oz.; bread, 2 oz., or potatoes, 5 oz.

8.—Potatoe pie. Carbon, 1,778 grains; nitrogen, 71 grains, cost, 2d. Flour, 3 oz.; dripping, ¾ oz.; meat, 2½ oz., or potatoes, 8 oz.; bread, 2 oz.

9.—Faggots, peas pudding, bread, and cheese. Carbon, 1,513 grains; nitrogen, 140 grains; cost, 2d. Liver, 3 oz.; bacon, 1 oz.; herbs and peas, 3 oz.; bread, 2 oz.; cheese, ½ oz.

10.—Meat, vegetables, bread, and cheese. Carbon, 1,441 grains; nitrogen, 75 grains; cost, 2d. Meat, 3 oz.; potatoes, 8 oz.; bread, 4 oz.; cheese, ½ oz.

11.—Irish-stew and bread. Carbon, 1,568 grains; nitrogen, 72 grains; cost, 2d. Meat, 3 oz.; potatoes, 12 oz.; onions, 1 oz.; bread, 4 oz.

12.—Hasty pudding, herring, and potatoes. Carbon, 2,144 grains; nitrogen, 119 grains; cost, 2d. Flour, 6 oz.; skimmed milk, ½ pint; water; treacle, 2 oz.; 1 herring; potatoes, ½ lb.

Two of these largely exceed the standard quantity in carbon, viz., Nos. 2 and 12; whilst four, viz., Nos. 2, 4, 9, and 12, exceed it in nitrogen. No. 1 is quite insufficient for a man, whilst No. 12 is much more than enough.

Supper.

1.—Oatmeal brose, as at breakfast.

2.—Milk porridge. Carbon, 1,034 grains; nitrogen, 61 grains; cost, 1d. Skimmed milk, ¾ pint; oatmeal, 2 oz.; bread, 2 oz.; fat, ⅜ oz.

3.—Bacon and bread. Carbon, 1,250; nitrogen, 43 grains; cost, 1d. Bacon, 2 oz.; bread, 5⅓ oz.

4.—Tea, bread, and butter. Carbon, 670 grains; nitrogen, 29 grains; cost, 1d. Tea, ⅛ oz.; sugar, ½ oz.; skimmed milk, ⅛ pint; water, ⅝ pint; bread, 4 oz.; butter, ¼ oz.

5.—Coffee, bread, and butter. Carbon, 925 grains; nitrogen, 42 grains; cost, 1d. Coffee, ⅛ oz.; sugar, ½ oz.; skimmed milk, ¼ pint; water, ⅝ pint; bread, 5⅓ oz.; butter, ¼ oz.

In each of the first three there is an excess of the standard requirement, whilst the fourth corroborates the fact already mentioned, of the impossibility of providing an economical dietary where tea and butter are introduced.

Such, then, are abundant and cheap dietaries for our working classes, at a cost within the reach of all in England who obtain regular employment, or who are not oppressed with a large family wholly dependent upon the head. There are, however, multitudes of persons both in England, in our Sister Island, and on the Continent, who from these and other causes do not obtain so much income as would enable them continually to purchase this quantity of food, and to such it is of the greatest moment that they should restrict themselves to the cheapest food, as Indian corn, pease, bread, buttermilk, and skimmed milk. I need not, in this second paper, refer at length to the nutriment to be obtained from these foods, but a reference to the table will show that two pounds of Indian meal made into stirabout will afford more than the required nutriment at a cost of 2d. per day, and it cannot be doubted that this, with 1 pint of buttermilk, costing ⅓d., or of skimmed milk, costing ⅓d. to ½d., would, if the appetite for it did not fail, sufficiently nourish the system. Again, in the case of those who grow a large quantity of potatoes at a merely nominal cost, there can be no doubt that they may make them a principal article of food, and, taken in sufficient quantity with buttermilk or skimmed milk, would maintain health at a cost much below that of the dietaries which I have devised.

It is, perhaps, right that here I should refer to the economy in the food now afforded by that excellent invention of the day, the dining-rooms for the working classes; but since the labour, house rent, apparatus, and interest of money must be paid for, and since vegetables cannot be grown by them, it is clear that a profit must be made upon the food provided more than would equal the economy in cooking and the purchase of the goods at the wholesale price, and that the food supplied cannot be sold at so low a price as it might be produced at the labourer's home. The manifest advantage of these institutions is seen by comparing their food and charges with those of previously existing eating houses; they enable the working man to obtain good food at a cost within his means. They are not so fitted for the lowest fed as for the class who can afford to spend 4d. for dinner, since, as I have shown, meat is a costly food, and potatoes are not a cheap food; and I may add that the broth ordinarily contains but little nutriment. Thus, if we take the elements of an ordinary dinner of ½d. of bread, 1d. of potatoes, 2d. of meat, and 1d. of broth, we find the amount of carbon and nitrogen supplied is as follows:—

	Carbon. Grains.	Nitrogen. Grains.
Bread 4 oz.	500	22
Potatoes 12 oz.	577	22
Meat 2 oz., reckoned as 3½ oz., raw meat with bone	493	30
Soup, the meat liquor included in the meat	300	12
	1,870	86

which will give only 416 grains of carbon and 19 grams of nitrogen for 1d., whilst the foregoing dietaries yield from 700 to 1000 grains of carbon, and upwards of 50 grains of nitrogen for the same money. The profit upon the bread is 2½d. to 3d. the 4lb. loaf; upon the potatoes ½d. per ration; upon the meat 4d. per lb. of raw meat, and upon the broth nearly ⅚ths of a penny per ration, the cost of the meat liquor being reckoned in that of the meat.

I wish here also to make the shortest possible reference to the out-door relief provided throughout the country for the poor. The largest portion of this is given in bread, which is, no doubt, the proper course, but when meat is allowed it is most rarely that a useful part is selected. I have found that the usual supply is the scrag end of the neck, or the breast of mutton; the former, consisting chiefly of bone, and if it is to be profitable at all, there must be a taste for broth, and conveniencies for making it; the latter, containing more than half its weight of fat, which is almost universally rejected by the sick. Surely, in such a case, beef should be usually given, and the part selected should be the round, which consists of prime lean meat without bone, or, if mutton be preferred, no part could be so useful as a portion of the leg, at the part where that joint is usually cut in two by the butcher. I know that the present system is wasteful and inefficient.

Public Dietaries.

On proceeding to consider public dietaries I do not purpose to enter into large detail, but rather to content myself with a statement of the general principles which should be a guide in the selection of the particular food and in the general construction of the scheme of daily dietary. Those who are largely acquainted with the present dietaries of our public bodies will think that to merely indicate principles will be of little avail, since it is in details that the excellence or otherwise of the scheme must be tested, but in truth, the real wants of a man differ but little in any of the circumstances to which these dietaries refer, and the vast diversity of detail which at present exists is not due to any necessity, but to the absence of general principles in the construction of the scheme, and the deficiency of knowledge as to the particular food selected. It is almost incredible that in a country with so much intelligence and intercourse, there should be between 600 and 700 poor-law dietaries, including 40 in London, all

of which differ from each other, and that of country and borough prisons in England and Wales, not more than one-half have a uniform dietary. Surely, it is carrying out our system of de-centralization too far when there is no common authority, established by law, which enforces uniformity in subjects of such wide importance, and in conditions which themselves are so nearly uniform. If the result of this discussion should be to draw the attention of our legislature to this patent evil it will have conferred a great boon upon the whole community.

1.—Poor Law Dietaries.

The only principle which is acknowledged at present in these dietaries is that the food provided shall not exceed in quantity and quality that of the ordinary dietary of the same class of persons when out of the workhouse; and with this I cordially agree. The only source of difference is in the fact that to this moment the ordinary diet of the people has not been properly ascertained, and hence each person and each board of guardians has formed an estimate from general observation, but, as I mentioned in my former paper, this information has now been obtained, both from town and country, and will probably be issued in a few months, and pending that I must be content to simply affirm the principle.

The other general principles to which I would refer are these:—

A.—There must be a proper apportionment of the food according to sex and age. This is a subject of much difficulty, since there are no scientific data which refer to each year of life; and the relative wants of a man and woman vary with the size and activity of their bodies, rather than simply with sex, so that even a scientific man can only make a near appreciation to the truth. At present the reduction in the dietary for a woman, from the normal dietary for men, varies from half to a quarter, and it is only until a boy reaches the age of sixteen that he is considered to need the dietary of the man, and in both, I think, the dietary allowed is much under the requirement. From a consideration of the products of nutrition which pass out of the body, I do not think that the average dietary for women ought to be less than nine-tenths of that for men, neither being employed at hard labour.

The importance of the apportionment to age is exceedingly great, for it is only during the period of youth that growth progresses, and for healthy and suitable growth there must be sufficient food, and hence if the latter be withheld the former is deficient, and from the finality of the period of growth the loss can never be regained. Hence it is of far greater consequence that there should be abundant food given to a youth than to an adult, since the former can never regain his loss, whilst the latter can tolerate, with comparative impunity, much variation from his proper nourishment. I have entered at length into this subject in my work on "Health and Disease, as Influenced by the Cyclical Changes in the Human System," which may be found in our library, and I shall now only state that, in my opinion, above twelve years of age the dietary allowed ought to be that of a man; from the age of ten to the age of twelve, that of a woman; and that below ten years and above one year of age, there ought to be three scales of dietary, embracing the ages from two to five, from five to eight, and from eight to ten, or, as is far more natural, the dietary under the age of ten should be unlimited in quantity.

B.—The food supplied should be, in nature and variety, similar to that which they will obtain in later life. While it is a fact of the highest interest that the body can adapt itself to a great variety of circumstances to which it had not been accustomed, there can be no doubt that the changes are attended by risks, and that there are those who suffer from or sink under them, and in a wide point of view are not desirable. Hence, I would train up the body of the child as it shall be nourished when it becomes a man. I need not particularise the foods with which all are familiar, but precise information on this point will soon be supplied. As to variety of food, there can be no doubt that, within limits, it tends to improve the relish for and assimilation of food, and hence to increase nutrition, whilst beyond those limits, as we see amongst the well-fed classes, it lessens the appetite and the quantity of food that is eaten. Our ordinary habits do not seek for much variety at the first and last meal of the day, whilst one unvarying food at dinner would soon become unacceptable. Yet, even in that there is less diversity than at first sight appears, since all the food may yet be wound up under the terms, meat, potatoes, pudding; and the only variation is the kind of meat, and the components of the puddings, and the mode of cooking them. The dinner, then, should be varied, so that the same kind of meat shall not be always supplied, and that some change of food, or mode of cooking shall occur daily.

C.—The last observation may be regarded as trite and unnecessary, since it is admitted in most dietaries to a limited extent, but the next one, viz., that with variety in food there shall be uniformity in nourishment, is much disregarded. Thus, to select one from many dietaries which have been sent to me for my opinion on their fitness. On four days a week children from the age of five to the age of nine, have for dinner 3½ oz. of cooked meat and 8 oz. of potatoes, which contain between 1,200 and 1,300 grains of carbon, and nearly 70 grains of nitrogen, whilst on two days 10 oz. of suet pudding is alone allowed, containing about the same quantity of carbon, but only two-thirds of the quantity of nitrogen; but as the digestibility of the two diets must be very different, the defect of the latter is doubtless much greater than the chemical constituents indicate. On one day in the week there is rice pudding, and if we add ½ pint of milk to each 1 lb., which is no doubt beyond the mark, it will yield less than 800 grains of carbon and 27 grains of nitrogen, or a defect of more than one-third of carbon and nearly two-thirds of nitrogen. I may also make use of the same dietary to show another defect in the selection of food in poor-law dietaries: 16 oz. of rice, potatoes, or other vegetables, are allowed indifferently at dinner, the amount of carbon in the rice being nearly four times as great as that in potatoes, and nearly seven times as great as that in other vegetables, whilst the proportion of nitrogen in potatoes and vegetables is only one-third and one-fifth of that in rice. Thus, whilst the alternation of foods is necessary, it is manifest that by the present system even good guessing at truth is not effected, and that such recondite questions as the nutritive value of foods can only be answered by scientific authority.

D.—True economy consists in keeping the poor in health and strength at the least cost, and not simply in finding the cheapest dietary upon which they may live. Hence, 1st, a selection from the foods to which they are accustomed, of such as will yield the greatest nutriment at the least cost; 2nd, the cooking of them so as to obtain the whole of the nutriment from them; 3rd, by supply of proper kinds of foods with sufficient variety of flavour; by well-ventilated rooms and by exercise in the open air to keep up the relish for foods, for under such circumstances the food is better assimilated by the system (that is to say, less of it is wasted), and the cheaper and less savoury foods are with equal chemical value equally nutritive with others of a more costly kind.

E.—Of separate foods, I will refer to only two or three. For all persons below adult age, skimmed milk or butter milk, oatmeal, and bread should be given twice a day. The mid-day meal should always consist of meat and vegetables. The meat may be prepared as soup thrice a week with advantage, and to it should be added well-digested bones, pearl barley, and other vegetables, according to some of the numerous formulæ published by the Government, and of which the following three have been specially arranged by me:—

Soups.

Ox-head Soup.	Pea Soup.	Pea Soup.
Cost per ration ·92d.	Cost per ration 1·28d.	Cost per ration 1·16d.
Carbon ...... 1,117 grs.	Carbon ......1,201 grs.	Carbon ......1,099 grs.
Nitrogen ... 49 ,,	Nitrogen ..... 58 ,,	Nitrogen...... 61 ,,
Quantity per Ration.		
Meat off ox heads 2 oz.	Meat off necks of beef .... 1½oz.	Meat off leg of beef .... 2 oz.
Bones do. 2¼	,, pigs' heads 1	Bones do. 4
Pearl barley...... 2	Bones of beef...... 1	Barley 1
Rice 1	Barley 2	Split peas 1
Oatmeal 1	Split peas 1	Onions 1
Water to make 1¼pts.	Peameal............ ½	Carrots (crushed) 2
Pepper, salt, and herbs.	Onions 1	Oatmeal 1
	Carrots 1	Water to make 1¼pts
	Turnips 1	Pepper, salt, and various herbs.
	Water to make... 1¼pts	
	Pepper, salt, and herbs.	

There is also a formula for milk soup, for which I must refer to the report, p. 448.

It is desirable that dried herbs be used, and these, with the other vegetables varied on each occasion. This with bread alone, or, better still, with some kind of pudding, would suffice for the dinner on the soup days.

The use of tea and coffee should be restricted to the aged and the sick, or to special occasions.

In reference to fresh vegetables, when they are bought, it should be observed that, as they are dearer than bread, their use should be limited, but when they are grown by the labour of the paupers they promote healthful exercise, and supply food at a nominal cost. It is important to bear in mind that the necessity for any given quantity of fresh vegetables is relative only, whilst they may be eaten with equal advantage in large or in small quantities, provided there be a corresponding supply of other fresh food.

Dietary at Public Charities.

The subject of dietary in connection with our orphan asylums and other public charities, well deserves scientific inquiry under the direction of the Government, but as the most rigid economy would be out of place there, I do not purpose to include it in the present paper.

Dietary in Prisons.

The consideration of the dietary in prisons is of greater necessity than that in workhouses, not that the importance of the latter is less, but that the difficulties of the former are greater. There is no reason whatever why the dietary of our workhouses should not be finally settled at once, so that it might be uniform or equivalent everywhere, and be so adapted to the wants of the system that our youth should grow up healthy, and fitted for hard labour, and our adults not be tempted to the workhouse by richness of the food, and so that, whilst the food supplied is adapted to the wants of the recipients, it shall be supplied on principles of strict and true economy. But it is not so in prisons. You are aware that a Royal Commission has recently inquired into the present convict system, and a Committee of the House of Lords into that of county and borough prisons, whilst a special inquiry in reference to the system pursued in Hants has been made by the magistrates of that county. All these have reported and made various recommendations, but leaving the correction of evils of the dietary to further inquiry.

In prison discipline there are but two circumstances affecting the dietary which render it different from that of workhouses, for in both alike it is a duty to sufficiently feed the inmates, and to do this with the greatest economy. These are simple confinement with its implied restriction of fresh air, and exertion, and mental activity, and the influence of the labour exacted under hard labour sentences; and where these two influences have been estimated in a scientific manner there can be no difficulty in establishing a system of dietary which may meet the wants of the prisoners, and be everywhere uniform or equivalent.

Now what is our knowledge upon these two subjects. As to the effect of seclusion, we know theoretically that it would lessen the activity of all the vital functions, and thereby in itself be attended by less waste of the tissues of the body, and so far less food would be needed (as each of us would find if we kept in our room for a week), but practically it has been found that the weight of the body is lessened in confinement, a fact, resulting either from the deficient supply of food which was obtained, or from a diminished use made of that food, and hence, without proving either alternative, it was concluded that more food was required in a state of seclusion than would have been necessary in the ordinary circumstances of life. Upon this was based a scheme of dietary which was accepted by Government, in which the quantity of nutriment varied with the duration of imprisonment, in the following remarkable manner:—

Imprisonment.	Weekly. Carbon.	Nitrogen.
Class 1, 1 to 7 days,	19,860 grains,	889 grains.
,, 2, 7 days to 21 days	26,748 ,,	1,211 ,,
,, 3, 21 days to 4 months,	29,588 ,,	1,323 ,,
,, 4, 4 months and above,	33,782 ,,	1,566 ,,

As the compilers of this scheme were instructed that the dietary was not to be an instrument of punishment, it follows, that, in their opinion, mere duration of seclusion excited such an influence as to demand nearly double the amount of food at one period which was required at another, and that meat was required only in the conditions of the 3rd and 4th classes. It is usual to say that according to this scheme, the amount of food must be increased as the duration of imprisonment increased—or, in other words, that the effect of seclusion is a necessity for increased food, but in truth, if there be any logical sequence in the scheme, it is the contrary, for it begins with an amount of food which we have shown to be only about half of that which is required by the system, and it is only when the seclusion has continued 4 months that it is thought necessary to supply as much food as the system really requires. The truth is, that in ascertaining the cause of the loss of weight by seclusion, there were two valid agencies, only one of which was considered, and absurd as it may seem, it was not seen that giving a man only half the food which he required would lead to loss of weight of body, apart from any other agency whatever.

But the recent experiments made by Mr. Milner and myself for the British Association, by which not only the change in weight, but the quantity of nutritive and effete matters entering and leaving the body was ascertained in a scientific manner, it was proved that seclusion with inactivity does lessen the vital activity of the body, and causes a larger portion of the food to leave the body unused than occurs under ordinary circumstances, and hence that the ordinary diet out of prison would not suffice for the same person in prison without labour. The remedy for this is simple, and I shall again refer to it.

Then as to the relation of food to prison punishments. It may be known to you that these punishments are usually oakum-picking, turning a crank, or working a handwheel, and to these are added in some prisons the exercise of the shot drill, or various kinds of handicraft. There is the greatest diversity in the labour exacted by these methods, as I shall subsequently prove, but in addition to this, there is the greatest diversity as to the selection of them and the rotation of their use in different prisons. Thus, as I placed upon record more than five years ago, we find that in our county prisons some find no labour at all, others only that of ordinary trades, others have crank labour alone, others treadwheel labour alone, whilst in many, one of the two, or both of the two latter forms of hard labour are conjoined with some kind of trade. In many the treadwheel and crank are unprofitably employed, whilst in others they are used as mills or pumps. In some, women even work the crank and the treadwheel.

In some the treadwheel and crank are exceptional employments; in others they are universally used, but for a small part of the sentence; whilst in a third class they are the constant employments during the whole term of imprisonment. In most gaols they are chiefly employed for short sentences, and therefore for small crimes, and with insufficient food, whilst the light occupations are reserved for long sentences, with greater crimes, or frequent repetition, and excessive food. In some they are worked for an hour without intermission; in others thirty, twenty, fifteen, ten, and down to four minutes only. In some they are enforced for three hours daily, and simply as exercise; whilst in others the labour endures ten hours. In many, boys of fourteen years of age work the wheel and the crank; whilst in others, able grown men make shoes or pick oakum only.

In some the ordinary rate of the ascent on the treadwheel is fifty-six steps per minute, whilst in others it is so low as thirty. In some the ordinary pressure on the crank is seven pounds; at others, twelve pounds; the pressure being certain, and demonstrated by weights in one, and uncertain, depending upon the turn of a screw, in another. In some the ordinary number of revolutions per day is 14,400; whilst in others, in which the crank is still the chief instrument of punishment, it varies from 13,500 to 6,000 or 7,000, at the discretion of the surgeon, the prisoner being still without disease. In some the day's work may be performed in any part of the twenty-four hours with the index in sight of the prisoner; whilst in others it must be performed before the night, and with the index outside the cell, and so that the prisoner is unable to ascertain, from time to time, how much labour he has yet to perform. In some pumping is employed for an hour only, and even during that short period, as at Reading, there is no method of determining if any individual prisoner is labouring or not; whilst in others the labour is for the whole day pumping water into the sewers.

Oakum-picking is no labour in one prison, and hard labour in another; and in the latter it is two pounds for a day's work at Wandsworth and Westminster, and three pounds at the Coldbath Felds, whilst it is five pounds at a workhouse. In some the prisoner by good conduct obtains lighter labour, a commendatory badge, and a pecuniary reward; in others it is treadwheel from the first to the last; whilst in many, as at Wandsworth, the change of labour is due neither to crime, sentence, nor conduct, but to the number of prisoners.

With such diversity in the conditions upon which the dietary must depend, the Government Commissioners did not attempt to determine the true influence of each agent, neither did they insist upon a uniform plan of punishment being adopted before they prepared a scheme of dietary to meet it, but simply by ascertaining the effects of given dietaries upon the weight of prisoners condemned to hard labour (no matter what and how varied that labour was) they framed a scheme which should not only meet the requirements of the labour exacted (itself unknown), but be equal to the effect of simple seclusion without labour,—that also unknown. The result of such extraordinary guessing was, as might be expected, most anomalous. Thus, during an imprisonment of 7 days, no difference of food was supposed to be required, whether the prisoner performed the most severe labour with which we are acquainted—treadwheel labour—or was entirely at rest. Under 21 days, (tread-wheel, and other hard labour, being exacted,) he obtained as an equivalent for each 7 days' labour over the requirements of rest, only 1 pint of soup (containing 3 oz. of cooked meat, 3 oz. of potatoes, 1 oz. of barley-rice or oatmeal, and 1 oz. of onions, or leeks), affording about 1,100 grains of carbon, and 55 grains of nitrogen, or enough to meet the requirements of continued tread-wheel labour for about $1\frac{1}{2}$ hour only. For longer terms hard labour for 21 days was considered equal to no labour for 4 months, and to need the diet, class 3, which is below that of the unemployed Lancashire operatives, and for 4 months to be equal to no labour for an indefinite period, and to require the dietary of Class 4, containing enough food to supply the wants of the system on the ordinary conditions of out-of-door life. When the term of hard labour exceeded 4 months, it obtained a dietary of its own, in which 4 oz. of cooked meat was given four times, and 3 oz. thrice a week with bread, vegetables, gruel, and cocoa, containing 36,603 grains of carbon, and 1,610 grains of nitrogen, a dietary more expensive and luxurious than the others, but not greatly exceeding No. 4 in nutritive value.

The utter insufficiency of the allowance made for hard labour may be more strikingly seen when I quote the effect of these punishments as experimentally proved by myself side by side with the requirements of the system of the unemployed labourers.

Thus, the Lancashire operatives, when unemployed, required 30,100 grains of carbon weekly. Average crank labour requires 45,000 grains, and treadwheel labour 60,000 grains; but the amount allowed to the prisoners at hard labour is 19,860 grains, 26,748 grains, 29,581 grains, 33,782 grains, and 36,603 grains, quantities differing among themselves to the amount of nearly double of the least quantity, and below the maximum required quantity from one-third to three-fifths.

Surely no further proof can be required to show that no uniform dietary could be possible under so many varying and controlling conditions, and that in providing this scheme the information on which it was based was most defective, and that guessing, in a great degree, took the place of scientific deduction. Hence, in the absence of evident and sound guiding principles, it is not to be wondered at that the scheme was not accepted readily by the visiting justices of prisons, and even now from one-third to one-half of these prisons reject it, and adopt schemes which themselves are even less based on principle, and which exhibit the most astounding diversity.*

In the public inquiries in reference to Houses of Correction, before quoted, there was an evident desire to correct this evil, and to propose dietaries which should more nearly represent the accurate scientific knowledge of the day; but the result showed that such a course was impracticable.

In answer to question 914 of the Committee of the House of Lords—"Do you suppose that it would be possible, eventually taking into account the difference of constitution, to frame a uniform table of dietary for all prisons?"—I replied, "I cannot see the least difficulty, only that we should require a large amount of certain kinds of knowledge which are necessary. For example, the points upon which we are at present deficient in knowledge are these:—We want to determine precisely the effect of mere confinement upon the system; we only know in a general way that it does depress the system, but it must be determined precisely. Then we want to determine precisely the effect of meat, as to whether it is necessary in any and in what quantity. Then whether fat, which is a dearer food than starch, but analogous in composition, can be supplanted by starch, and in what proportion it must be given. We must also know what is the precise effect upon the system of those various punishments which are to be recommended, and having first decided upon the punishments, we must know what would be the amount of food necessary to meet such particular case, so that we have many subjects about which we are at present ignorant, and which are absolutely necessary to be understood before we can form a new scheme of dietary, but all of which information can be obtained by proper experiments in prisons."

When this evidence was quoted by the chairman to Dr.

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* I cannot on this occasion enter further into this question, but would refer to my papers published in the *Philanthropist* for 1856, and to the evidence given before the House of Lords, in 1863.

Guy, and the question asked (No. 3,799), " Would your opinion go along with that view," that gentleman replied, " I think I may answer, that in a scientific point of view it would be desirable to have such experiments made, but I do not think them necessary in a practical point of view. We do not want to ascertain those points with such minute precision as the term scientific would imply— we can get at them roughly. I repeat that I should myself like to see the basis that I have mentioned adopted, namely, one pound of bread per day and one pound of potatoes (that is what was given in the fourth experiment at Pentonville), because the potato element is so essential to a sound dietary, and then varying the quantities of other things. I should be satisfied with making these experiments in the case of prisoners variously employed within our own prisons; some with hard work, some with a little lighter work, and some few could be found with no work at all, or such very light work as is almost tantamount to no work, for instance, picking tow, which is very light work ; but I do not think it necessary to make these experiments in so scientific a manner as is laid down in that evidence." To the further question, No. 3,801, " I think the Committee understand what your view is ; that though it is not absolutely necessary, in a practical point of view, that the point should be determined with scientific precision and minuteness, still that it would be very desirable to go into these different questions with a view to obtaining an ultimate finality, so to speak, to the dietary basis, whatever it may be, which may be hereafter adopted." The answer is, " It would be desirable to make such experiments."

Hence it may be accepted that, before the present evils can be corrected, there must be a large amount of information obtained upon the most recondite questions to which physiological and chemical knowledge can be applied, and which would require for its proper attainment the greatest skill and familiarity with the subject which the present day can afford. But here arises the most important questions, Are we to be satisfied to " get at them roughly ; " and Do we " not want to ascertain these points with such minute precision as the term scientific would imply ?" Are we to set aside the increased knowledge of our day, with the improved means and methods of inquiry which, if used, would conclusively prove the facts required, and fix the dietary upon a firm and final basis, or pursue the unsatisfactory course adopted twenty years ago, taking weight of body, with its variation in mere fluids and in fat, as an apology for a scientific guide, and by making such so-called experiments in a convict prison, where there are not the hard labour of the crank and treadwheel, blindly guess at the dietary necessary in county prisons with their treadwheel and crank labour; or, worse still, will it suffice to ask the advice of visiting justices as to the value of the dietary under their supervision, and frame new dietaries upon their opinions ? Surely such a course would not be creditable to our day, and would lead to a continuation of the present evils. There is no clashing between experiments made " in a practical point of view " and got at roughly, and those made with scientific precision. What is scientific precision but an exact basis for practice ? and what are results got at roughly, and in a practical point of view, but those arrived at by a neglect of the only means by which exactitude can be demonstrated, and therefore only guesses at truth ? I trust that we shall agree that the national importance of the subject demands that this question be now so considered that it may be finally settled.

The following are the questions which, in my opinion, now demand solution :—

A.—Shall the principle be adopted which was finally laid down by Sir James Graham, that the dietary shall meet the requirements of the prisoner under the different conditions of prison discipline, and thus maintain his health and strength, or shall it be made an instrument of punishment, and for any period be insufficient for the wants of the system ? Without this, no step can be taken in the inquiry, and it must be for the legislature to decide the question. It must, however, be borne in mind, that if it be decided to give insufficient food, you take the subject out of the hands of science, and must let justice fix the amount of deficiency, for although it is evident that deficient food must lead to injury of health, as its action is slow and the different degrees of health are not marked by clear lines, it is impossible to estimate accurately the injury inflicted. It is a dangerous mode of punishment, and particularly when it is often repeated.

B.—The system to be pursued in gaol discipline must be fixed so that a sentence shall always and everwhere carry with it an absence of labour or a definite kind and amount of labour. Hence it must be determined whether labour shall be a part of all gaol discipline or not, and certain kinds of labour must be selected and prescribed, and thus the sentences may be without labour, with medium labour, and with hard labour. In my evidence before referred to (Question 842), I affirmed the principle that labour should be a constituent part of every sentence, on the ground which at first sight may appear paradoxical, that, within limits, it would allow the food supplied to be less costly, for without labour it has been shown that food is wasted, and either the system must be ill-nourished, or the higher kinds and more costly food, as meat, must be given so as to supply an increase of vital stimulant in the form of nitrogen. In some cases, therefore, it may be shown that the exertion supplies its own food, and as this is a most important principle, I will quote the answer which I gave to Question 827, "Would you explain to the committee a little on what principle you would act in that case ?" " It would seem to me that the right course of proceeding would be this, to determine the amount of food which is necessary to maintain a person in fair health in the open air, and to endeavour so to arrange that it shall also maintain the prisoner in health in a state of confinement. The difference of the two conditions is mainly, or perhaps entirely, this, that in confinement you have less vital action in the body, less digestion of food, and less assimilation or conversion of food into the tissues of the body. The aim, therefore, should be so to arrange the prison discipline that there shall be such an increase of this assimilation over the present amount, with inaction, as shall enable the cheap food, which is sufficient for the support of an agricultural labourer, to keep the prisoner in health. If that be not done, it will be necessary, as we do at present, to give more nitrogen. With the deficient assimilation existing in confinement, you must increase the vital action of the body; but if you adopt the other course, that of giving, exercise and fresh air, such as a labourer would have you do not need to give a proportionate increase of nitrogen; you therefore assimilate the conditions of the prisoner much more to those of an ordinary labourer, either in quantity or in quality. I also give my assent to the proposition contained in question 836, viz., " Whenever you have a deficiency of labour you might make either the labour or the open-air exercise, whichever it may be, more or less a substitute for the amount of nitrogen which otherwise would be supplied in meat."

Sir Joshua Jebb assented to this statement, when it was referred to him in Questions 1,290 and 1,291. Thus he answered :—" I think that the fact of prisoners in separate confinement requiring a very large amount of food to support them against the depressing influence, as it is termed, of separate confinement may partly arise from the less amount of exercise they get, because it is really a fact that though the men are not required to use great bodily exertion in the trades which they carry on, they do require more food than men would require out of doors." And in answer to the following question :—" So that if a proper amount of exercise were given to the prisoners, with a proper amount of fresh air, they might still be subject to the hard fare which you think is necessary as a proper punishment without its exercising any deleterious effect upon their system." Sir Joshua answered " Yes."

So also when the statement was referred to Dr. Guy, he answered (No. 3,733), "I think that the exercise which a man takes, whether you call it hard labour or any other labour, tends to promote the assimilation of that food which he eats." Hence it is admitted that the plan proposed by me would effectually dispose of the evils of seclusion, and would improve the nourishment of the system, and so far allow of less expensive food being given to maintain health.

When the several kinds of hard labour have been selected it would be easy to render their action nearly uniform, and their precise influence upon the body can be determined and the amount of food to be supplied ascertained. My own experiments on crank and tread-wheel labour, and shot-drill are the only ones on record, and may be found in the Report to the British Association for 1861, but it may be well to quote a part of the substance of the answer to Question 845: "Crank labour increases waste from two to three times during the exertion, and in the whole 24 hours the increase is 1½ time. Treadwheel labour increases it 5½ times during the labour, and twice when calculated upon the whole 24 hours. Shot drill increases it four times during the period of exertion. Hence the information is already acquired for the experimental application of foods to labour.

C.—The mode by which the amount of food required in these different conditions would be determined, and the effect of various kinds of food is very simple. Besides the evident effect upon the body, as shown by variation of weight, colour, firmness of muscle, colour of blood, strength, &c., it would only be necessary to determine by chemical analysis the amount of unused food passing off by the bowels. The general plan of procedure is stated in my answer to questions 915 and 916. Thus—"I should first take a basis dietary, such as is used by the agricultural population, and such as I think would be suitable for persons condemned to light labour or not to hard labour; with that dietary I should think it necessary that they should have so much exercise or so much labour in the open air as should induce the whole of that food to be assimilated. That is the great difficulty which must be overcome by experiment, viz., to find out what amount of labour is necessary, with a given dietary, to enable the whole food to be assimilated. For that purpose it would be necessary to take five prisoners of average age and power, and place them upon this dietary, to determine every day the effect upon the weight of the body, the colour of the blood, and also the effect upon the excretions, that is to say, to prove whether due assimilation occurs, by determining the amount of food passing off by the fœces. That is the only scientific inquiry which is necessary. If it be shown that the whole of the evacuations were so reduced in nutritive value as to be only equal to that of an ordinary individual of the community, then we should suppose that a proper proportion of the food was assimilated." "Having first of all settled this question (which might require a great deal of variation in the elements of the food) with regard to light labour, and having determined also the proportionate effect of the different kinds of hard labour upon the system, I should be able to devise experimentally a scheme of diet which would meet the case. I should take five persons upon each of the systems of hard labour, and put them upon that dietary, and determine in the same way the effect of this food upon them. In the course of twelve months I have no doubt that a sufficient number of expriments would have been made to settle the whole of these questions."

D.—I think it is to be regretted that notwithstanding the admitted necessity for the foregoing experiments, Dr. Guy should have allowed himself to present six schemes of prison dietary in which meat and bacon are entirely excluded, and more particularly when the real nutritive value had not been ascertained and apportioned to the condition of labour, and when no other conditions were recognised than that of duration of imprisonment. This seems to be supported by the answer to question No. 5,325. "Is this diet one which you have drawn up in order to show how a diet may be framed without the meat element in it?" The answer is, "I have partly drawn it up to show how a diet may be framed without the meat element in it, but at the same time I should be prepared to recommend it for trial;" and in answer to the preceding question, "whether he would be afraid of employing a man upon this diet, if the allowance of hard labour ran as high as 6 or even 8 hours a day?" the answer was, "No, I should not be afraid of it; at the same time all these suggestions require to be tried," shewing that, at the best, the dietaries were but guesses, and could not be adopted until that which should have preceded them had been effected, viz., scientific inquiries into the subject.

On calculating the nutritive value of these proposed dietaries with those so long in use by the Government, I find very remarkable differences. Thus:—

	Proposed Dietaries.		Home Office Dietaries.	
	Carbon.	Nitrogen.	Carbon.	Nitrogen.
Class 1	13,930	546	19,860	889
„ 2	16,625	630	26,748	1,211
„ 3	22,525	875	29,588	1,323
„ 4	36,834	1,755	33,782	1,566
„ 5	41,979	1,932	36,603	1,610
„ 6	48,412	2,352	...	...

The first three classes in the Government dietary have already been shewn to be below the natural requirements of the system, but in the proposed dietary the nutriment is lower, so that the third class is only equal to the Government first class, and the results at the end of twenty-one days must be deplorable. There is then a sudden increase from the addition of Indian corn and milk, and an increased quantity of oatmeal quite disproportionate to the progressive increase in the duration of imprisonment, and so great that the quantity allowed to the preceding class is nearly doubled, whilst the whole of the 2nd, 3rd, and 4th classes in the Government scheme are passed over, and one bound made from the lowest to the highest class. The nutriment in the proposed 4th, 5th, and 6th classes is much above that of the highest class of the Government.

E.—Is it not remarkable that at this day it is still customary to compare dietaries by quoting the number of ounces of fluids and solids which they contain, as though there were no material difference between 1oz. of potatoes and 1oz. of cheese, oatmeal, or tea, and not only so, but to reason upon the results as if they were all equal. This is illustrated by the proposed dietaries just quoted, where the two first classes have the same gross weight as those of the Government scheme, whilst their nutritive values are so different. In this mode no account is taken of the 2 oz. of oatmeal in each pint of gruel, nor anything of the nutriment contained in the milk.

F.—In prison dietaries, suited to county and borough prisons, no unusual article of food should be introduced, as, for example, Indian corn meal, which is not thought equal to wheaten flour by any people even in the Western States of America, since a distasteful food certainly lessens the appetite for food, and, being less perfectly assimilated, will, for one or both of these reasons, increase waste of food and less perfectly nourish the body. Hence, apart from the disgust of the prisoner, it is not sound economy. It is, doubtless, possible to effect this in convict prisons with long sentences, since in progress of time the body will acquire the aptitude for a new food; but even then it has not been shown that the very large amount of food which they are said to require may not be due to the imperfect use of that which is adopted.

G.—The necessity for fresh vegetables daily is doubtless

much less now than formerly, since there is now abundance of other fresh food. Conditions of prisons which led to scurvy 30 years ago, included many other elements besides a diminished supply of fresh vegetables, and there is no instance to be found on record where, with an abundant supply of fresh meat and bread, scurvy ever appeared. Even in the Arctic regions, as Dr. Hayes and Dr. Kane have abundantly proved, the necessity for fresh vegetables never occurs whilst there is plenty of fresh meat, and, indeed, the Greenlanders never suffer from scurvy when their food is plentiful, although they never obtain vegetables. Such conditions as those quoted at Millbank do not now occur in any part of England; and as potatoes are a much dearer food than flour or oatmeal, their use ought to be restricted as much as possible, provided there be a sufficiency of other food allowed. In my inquiries in Lancashire and elsewhere, I have found many who have not eaten fresh vegetables for many months at a time, and yet found no evil to result.

H.—In concluding this subject, I may remark how false is the comparison which is made between prison dietaries and those of workhouses, or those of ordinary life. We have already seen that the three first classes in the government scheme contain less nourishment than that supplied to the Lancashire operatives; and it is only in the fourth and fifth that sufficient food is allowed. As to the relation of these dietaries to that of the community out of doors, the information about to be issued will supply abundant means of comparison. But with regard to workhouses, there can be no doubt that the three classes referred to are below any workhouse dietary.

I have only one further remark to make, and that will have reference to the unfair position in which medical men are now placed in reference to this and other subjects. It is expected not only that medical practitioners shall be well fitted for the practice of their profession, but that they shall also be authorities upon the various recondite questions which are only accessory or incidental to their practical knowledge. Hence upon questions of lunacy, public health, poisoning, and dietary, it is expected that any medical man who may be in any way connected with the case under investigation should give opinions quite in accordance with the most advanced knowledge of the day. This is not required in other occupations in life. A graduate in arts must be acquainted with mathematics, but is it expected that every graduate should be able to fill a professorial chair, or to resolve the most abstruse problems of the science? Is a lawyer expected to be familiar with each department of the law, or an artist equally capable of excellence in every walk of art? Why, then, is it not well recognised, that the essential duty of a medical practitioner is capability for the treatment of disease, and that questions on collateral subjects should be regarded as special ones, to be solved not by the busy practitioner, but by those specially given to such investigations. It is unreasonable to require a workhouse or gaol surgeon to give a scientific opinion upon, and to frame dietaries for those under his care if the aim is to pass beyond the region of ordinary observation and to establish something recondite, as for example a dietary which shall sufficiently nourish the body at the least cost.

DISCUSSION.

Mr. HARRIES (Poor-Law Board) said he rose to offer a few observations on the very able paper of Dr. E. Smith. He had a very large family, numbering somewhere about 120,000, and it might not be out of place to say a word or two respecting this family—the poor in workhouses. Sir James Graham, in 1843, sanctioned five scales of diet for prisoners, and the amount of food in each scale was regulated according to the length of imprisonment and hard labour. Prisoners imprisoned for short periods got the lowest dietary, class 1; and those whose sentences were the longest the highest dietary, class 5. In the parliamentary paper, issued in 1857, containing the dietaries of prisoners, there were, exclusive of convict establishments, 86 prisons, and in these there were altogether 378 dietaries. Four prisons had 1 dietary each; 2 had 2; 11 had 3; 10 had 4; 57 had 5; 2 had 6. For the sake of distinction he would call Sir James Graham's dietaries official dietaries, and those which differed, non-official dietaries. Now, the official dietaries, as issued, were in use in 30 prisons, and in 4 more, but with different periods. In several others some of the scales were in use. The case stood thus:—

	Official Dietaries.	Non-Official Dietaries.
The 1st Class Dietary in use in	50 prisons	31 prisons
The 2nd ,, ,, ,,	44 ,,	37 ,,
The 3rd ,, ,, ,,	39 ,,	42 ,,
The 4th ,, ,, ,,	43 ,,	31 ,,
The 5th ,, ,, ,,	35 ,,	24 ,,

With regard to the non-official dietaries, it was difficult to find out the principle upon which they had been framed—if, indeed, there was any principle in the matter at all. The amount of nutriment was less in the second class dietary than in the first in the prisons of Westmorland and Huntingdon. It was less in the third than in the second, in Devon, Cambridge, Spalding, Horsemonger-lane, Wakefield, Denbigh, Morpeth, Tynemouth and Hexham. It was less in the fourth than in the third in Durham, Falkingham, Cambridge, Monmouth, Usk, Morpeth, Tynemouth, and Hexham. It was less in the 5th than in the 4th in Anglesey, Nottingham County, and Nottingham House of Correction. All the dietaries prescribed three meals a day, except St. Albans, where only two were given, breakfast and dinner. There was no reason given for this arrangement. He supposed the digestive powers of the criminals in this place were not so active as elsewhere. Prisoners committed to Cumberland gaol for seven days got only 18oz. of bread per day; while prisoners in Alnwick gaol for the same period (seven days) got 16oz. bread, 12oz. oatmeal, and 1 pint of milk per day. The amount of nutriment in the latter was about three times that of the former. The weekly quantity of food, inclusive of the ingredients in the liquid food, in these dietaries was:—

	I. CLASS.	II. CLASS.	III. CLASS.	IV. CLASS.	V. CLASS.
	oz.	oz.	oz.	oz.	oz.
Official Dietaries	145¼	209¼	259¼	269¼	334
Average of Non-Official Dietaries	183¼	234½	273½	287¼	327¾

Now, measuring these dietaries according to the data at the Kensington Museum, supplied by Dr. Lyon Playfair, the amount of nutriment was:—

CLASSES.	Quantity of nitrogenous ingredients.	Quantity of substances free from nitrogen.	Quantity of mineral matter.	TOTAL.
	oz.	oz.	oz.	oz.
I. CLASS.				
Official dietaries	11·45	79·36	2·61	93·42
Average of non-official dietaries.	14·18	91·38	3·19	108·75
II. CLASS.				
Official dietaries	16·14	108·47	3·55	128·16
Average of non-official dietaries.	17·31	105·81	3·98	127·10
III. CLASS.				
Official dietaries	17·32	112·03	3·87	133·22
Average of non-official dietaries.	20·44	115·84	4·28	140·56
IV. CLASS.				
Official dietaries	21·00	119·45	4·08	144·53
Average of non-official dietaries.	21·93	119·67	4·40	146·00
V. CLASS.				
Official dietaries	21·46	129·07	3·97	154·50
Average of non-official dietaries.	22·11	124·20	4·58	150·89

The weekly cost of these dietaries was—

	I. Class.	II. Class.	III. Class.	IV. Class.	V. Class.
	s. d.	s. d.	s. d.	s. d.	s. d.
Official Dietaries	1 $2\frac{1}{4}$	1 $9\frac{3}{4}$	2 $1\frac{3}{4}$	2 $9\frac{1}{4}$	3 $0\frac{3}{4}$
Average of Non-Official Dietaries	1 $5\frac{1}{2}$	1 11	2 5	2 7	2 10

With regard to the dietaries of workhouses, able-bodied paupers were not dieted according to any uniform rule—their dietaries varied in different workhouses. The dietaries of insane, too, in lunatic asylums varied considerably. The average quantity of food for the able-bodied man in the workhouse was $243\frac{3}{4}$ oz. per week; for the insane man in the lunatic asylum, $263\frac{1}{2}$ oz.; for the male prisoner, the average of the 2nd, 3rd, 4th, and 5th scales was $269\frac{1}{4}$ oz.; for the male convict, the average of Pentonville, Millbank, Chatham, Portland, and Portsmouth dietaries was 366 oz. A better estimate of the relative value of these dietaries might be formed by measuring them according to Dr. Playfair's data. The amount of nutriment was:—

	Quantity of Nitrogen Ingredients.	Quantity of Substances free from Nitrogen.	Quantity of Mineral Matter.
	oz.	oz.	oz.
Able-bodied Man	22·10	102·91	4·36
Insane	23·45	104·84	4·02
Prisoner............	19·57	116·88	4·01
Convict	25·15	137·71	4·47

The weekly cost of the dietary of the pauper was 2s. $3\frac{3}{4}$d; insane man, 2s. $6\frac{3}{4}$d.; prisoner, 2s. 5d.; and convict, 3s. $10\frac{1}{4}$d. The subject of the dietaries of prisoners had of late attracted considerable attention; and during the last session, the Lords appointed a committee on prison discipline, and that committee received a large amount of evidence in reference to dietaries. In the report of that committee the dietaries recommended by Dr. Guy were given. Now, to these dietaries there were decided objections. The first objection was, they prescribed no meat. The present dietaries allowed meat more or less, and the average weekly quantity of the several scales which allowed meat was $15\frac{1}{4}$ oz., in a cooked state. In the workhouses the average quantity to an able bodied man was $16\frac{3}{4}$ oz.; to a male lunatic in an asylum, 26 oz. There was no doubt that the poor in this country did get meat, but the quantity was very small in some cases. There were, too, in these dietaries, objectionable articles of food, viz., milk and Indian meal. Our knowledge in this country of Indian meal was not sufficient to warrant its use in large quantities in prisons. To milk there was no objection as an article of diet, but the poor of this country did not get it in such large quantities as that proposed by Dr. Guy, viz., seven pints and ten pints a week. Now if we compared Dr. Guy's proposed dietaries with the official dietaries (Sir James Graham's dietaries), the following was the result:—Dr. Guy's 1st class dietary prescribed 23 per cent. less food per week than the official dietaries; the 2nd class, 20 per cent.; the 3rd class, 24 per cent; the 4th class, 48 per cent. more; the 5th class, 40 per cent.; and the 6th class, 69 per cent. more than the 5th. As regarded nutriment, Dr. Guy's 1st class dietary was 32 per cent. less than the official dietary. The 2nd class, 39 per cent.; the 3rd, 24 per cent; the 4th, 25 per cent. more; the 5th, 33 per cent., and the 6th, 45 per cent. more. He believed the Government had appointed Dr. Guy and two other medical gentlemen to inquire into the subject of the dietaries of prisoners. Now, these dietaries of Dr. Guy's were, he supposed, forecasts—if so, he had no faith in them. The important question to be considered was, ought the dietaries of prisoners to be revised or not? In answering this question, he would quote from a letter he addressed last year to the Royal Commissioners on penal servitude, the reasons why he was of opinion that the dietaries should be altered:—"1. Because the labour exacted of the convict is not greater than that performed by the agricultural labourer, and hardly in excess of that required of the able-bodied man in the workhouse. 2. Because the diet of the convict is much in excess of the diet of the several classes mentioned. 3. Because the convict is placed, in regard to food, in a better position than it is possible for the honest labourer to attain. 4. Because this is a temptation to crime. 5. Because it is unjust to the convict whose physical condition has been raised above its usual level, and hence he is placed, on his release from prison, if unreformed, in a better position to commit crime again. 6. Because the cost of the diet is greatly above that of the pauper, the lunatic, and the agricultural labourer. 7. Because of the expense—it being unjust to the public to have to pay 4s. a week for the food of the convict while the poor lunatic and pauper can be properly maintained at an average cost of only 2s. 4d."

Mr. Merry said, as an old visiting justice of one of the model prisons in a neighbouring county, and having had the honour of being examined before the Lords' committee on the question of prison discipline and dietary, he was desirous of making a few remarks on Dr. E. Smith's valuable paper. If they wished imprisonment to deter from crime, they must cease to supply such an excessive diet as to afford temptation to a poor man to commit crime in order to get into prison. He held the opinion that a man ought to be really punished when he was sent to a prison. He would not injure his health, but he would take care not to give him an ounce more food than his constitution required. In looking at the question of food with regard to public dietaries, Dr. Smith's paper had taught him the value of the quality of food rather than the mere quantity; and he thought, with reference to what had fallen from the preceding speaker, that it was impossible to lay down one general dietary that would suit all counties and all populations alike. The diet of the labourer in Wiltshire or Berkshire differed very much from that in Yorkshire. He thanked Dr. Smith for telling him the value of a pound of a particular article of food, with reference to the amount of carbon and nitrogen it contained; and if the physiological definition of man was that he is a "cooking animal," it was useful to know the nutritive value of the food he was going to cook. The serious question affecting the great bulk of the community was this, that upwards of 100,000 criminals annually left the prisons of this country, and it was important to consider what was to become of that army of 100,000 enemies to society. If such men had an abundant diet in prison, they got so accustomed to that kind of food that they could not do without it when they came out of prison. They were driven again into crime in order to obtain it. To every thinking man, therefore, the investigations of Dr. Smith on the subject were of the utmost value, and might be considered of importance in a national point of view.

Mr. Cardwell was desirous to ask a question upon one point in the paper. He understood Dr. Smith, speaking of private dietaries for the poor, to recommend Indian corn meal as a cheap and nourishing article of food; but in speaking of prison dietaries he also understood Dr. Smith to state that that article would not do for a continual diet, inasmuch as it was somewhat disgusting to the appetite, and prisoners would not thrive upon it. It seemed to him somewhat anomalous to recommend, as the continual diet of poor persons not in prison, that upon which Dr. Smith had stated prisoners would not thrive.

Dr. Smith said in none of his dietaries had he recommended Indian corn meal, but he had stated with regard to private dietaries, in cases where persons could not procure more food than was actually necessary for the sustentation of life, that Indian meal was obviously the cheapest in proportion to the amount of its nutritive qualities.

Upon that principle it was largely used by the Irish, but when they could obtain better food they invariably abandoned it as not agreeable to the appetite. In long imprisonments in convict establishments the body might become used to Indian meal, and the distaste for it might cease, but it was not suited for short imprisonments.

Dr. Lankester, F.R.S. (responding to the chairman's invitation), said he should be very happy to say a few words on Dr. Smith's paper, but he had on this occasion dealt more with details than in the previous paper, and therefore it was more difficult to follow him. At the same time he felt that these contributions of Dr. Smith to the philosophy of diet were of very great importance; and even if he (Dr. Lankester) and others did not agree with him in every point it was very desirable that the public should be led to discuss this question in relation both to economy and health. He quite agreed with Dr. Smith that the system on which our public dietaries had been laid down was essentially a bad one. On looking at some of those dietaries he found the estimate of the diet was put down under the two heads of solid and liquid. It was impossible to come to a proper conclusion upon diet so vaguely estimated as that. Many liquid foods contained a large proportion of nutritive properties, whilst many forms of solid food were almost destitute of them. He thought the time was come when the Government of this country, in constructing dietaries for hundreds of thousands of people, should regard the subject from a scientific point of view, and it should not be left to persons accidentally placed in positions of importance to estimate what should be the diet of the people in our public establishments. At present they seemed as though they were constructed in quite an accidental way. Some recommended rice, others substituted potatoes for rice, and in that way they went on substituting one thing for another without any definite system. Within the last few years, as the result of careful investigation, they had been able to point out what really were the relative nutritive properties of various foods. Dr. Smith, in his previous paper, called attention to the fact that the two elements, carbon and nitrogen, as contained in different foods, indicated their relative value. That was a highly scientific position when contrasted with the "solid and liquid" dietaries of the ordinary Government system. He would say, however, that with regard to these scientific estimates of foods, they were not always to be relied upon as entirely correct, but this he would add—that the errors of the scientific man were infinitely smaller than the errors of the merely practical man. Those of the practical man were sometimes of the gravest kind, while those of the scientific man allowed of correction by the very means which had led him to his previous conclusions. In the discussion upon Dr. Smith's last paper, he took the liberty of saying that he did not think some articles of diet had been estimated at their proper value, in taking merely the quantity of carbon and nitrogen they contained. Now nitrogen was contained, not only in what were universally acknowledged to be the nutritive constituents of food, such as fibrine, albumen, and caseine, but it was also found in another constituent, namely, gelatine. He thought sufficient attention had not been given to this last mentioned substance. Some 30 or 40 years ago the French government directed an inquiry to be made into the nutritive qualities of gelatine, which entered largely into the constituents of soup, so much used in that country; and two members of the French Academy gave their opinion that gelatine was not a nutritive element of diet, and would not form the tissues of the body. Subsequently, there appeared a report from the Belgian Academy condemning gelatine as an article of diet, and from that time a notion had very much prevailed among physiologists that gelatine was not digestible, and, like cellulose, was not a nutritive constituent of diet. Consequently, in a diet containing gelatine, the quantity of nitrogen could scarcely be taken to represent its real nutritive value. He would ask Dr. Smith whether he had given any attention to that point. Recently it had been stated that gelatine, when converted into albumen, was very nutritious. But of this they had no proof, and it was a matter which ought, if possible, to be decided. Another point was that cheese was an indigestible article of food compared with meat and bread, and therefore it would not be correct to take the nitrogen of cheese and put it down as the true measure of its nutritive value. It seemed to him that cheese was only a suitable diet for the hard-working classes of people —persons who had a great deal of open-air exercise. A hard-working man would find it more economical to purchase cheese, if he had but a few pence to spend for his meal, than meat; but the question arose whether it was better for the wife and children indoors to have cheese? whether it would not be better in their case to expend the money upon some more digestible, though less nitrogenous, article of diet? These were questions which must arise at every point of the examination of Dr. Smith's dietaries, and they would only be determined by experience—and that not a limited experience. Then again, Dr. Smith had constructed private dietaries and said some persons had prospered on them, but prospering thereon for a month or two was different from prospering for a lifetime. He said this merely to caution people against adopting Dr. Smith's private dietaries, upon the notion that they might do so with impunity. If a person were restricted to living upon two shillings a week, it would be better to give Dr. Smith's dietaries a trial than to spend the money indiscriminately, as poor people who had no knowledge of the subject were very apt to do; but it might become a question, when a person had to feed others, whether these economical dietaries would be the best provided he could afford to spend more money upon a greater variety of food. There was also another point with regard to them, viz., that they excluded everything which could be termed luxurious diet; there was nothing for the taste—tea and sugar, and those essences which flavoured food seemed to be utterly excluded from these dietaries. He did not think it was wise to do that.

Dr. Smith said he had not done so; tea was included in most of his dietaries.

Dr. Lankester understood Dr. Smith to say that tea was expensive and might be dispensed with. He did not think the highest estimate should always be put upon that which went to form tissue, but they must appeal to the palate as well as to the stomach, and they all knew that pleasing the palate had a great deal to do with the subsequent process of digestion. Therefore, agreeing with these dietaries where the object was to save money, he at the same time cautioned people against their use for any length of time, except under circumstances of compulsion. He felt this Society was much indebted to Dr. Smith for the very able manner in which he had brought forward this subject of diet, and he trusted it would raise a more general inquiry as to the nature of food. He believed the losses arising from the improper use of diet would be more than enough to feed the whole population. As to the dietaries of prisons, he did not think they ought to punish people in their diet. To carry out any systematic plan of limiting the diet to an amount on which human life could barely be maintained would be to inflict a punishment which was never contemplated. Rather than do that he would give rather higher dietaries than some had declared were sufficient for the sustenance of the body. He did not think those who watched the rations served out to prisoners would be impressed with the idea that they were living luxuriously, or that the most wretched amongst the criminals would wish to remain in durance for the sake of the food they got in prison. That it was in many cases an advantageous system, both of diet and discipline, he did not hesitate to say. Men who went in as emaciated and enfeebled drunkards, after they had submitted to this admirable system of diet and exercise, for a month or two, came out strong men. He was almost inclined to wish

that there were prisons for respectable people who could not restrain themselves within proper limits, both in eating and drinking. Six months at Clerkenwell or Pentonville would put them on their legs again, and enable them to go on prospering for years without incurring any doctors' bills.

Dr. Dickson, following up the concluding remarks of Dr. Lankester, would state, for the information of those interested, that in Germany there were several establishments called "bettering houses," in which the benefits of the description of diet and management, spoken of as being beneficial to high livers, could be obtained.

The Chairman wished, in relation to the fixed quantities in public dietaries, to repeat the precautionary observation arising from the wide physiological differences of assimilative power, and of hunger in different individuals, that not only should the quantities of the various sorts of food be left undefined for very young children, but, as respects adults, that one simple and main article of food should be allowed without stint. Experience had shown that the extra consumption by the few who ate more than ordinary was more than counterbalanced by the economy of the many who ate less on this plan. This precaution observed, there would be little danger to health, or of making dietaries an undue punishment in prisons, nor would there be any fear of their becoming too attractive. No dietary should be adopted without due observations on the health and the strength of prisoners, and such observations were in favour of the simple and more economical diets, which were the subject of much theoretical medical apprehension. He had heard the medical men who had charge of the prisons in which the simpler diets were in use, and the personal cleanliness and other sanitary conditions of the prisoners were well attended to, often express a wish that they had their private patients in those prisons, for if they had they could frequently save them and produce the best effects. Whilst some prison physicians attributed a large part of the extraordinary improvement in health produced in well-managed prisons, with the simpler diets, to the teetotalism or entire exclusion from alcoholic drinks, others ascribed the larger share to the abstinence from the use of tea, as the improvement in the health of females who were not given to drinking was as great as that of the males who were. The observation of the effects of dietaries in classes of persons had, however, yet to be closely made and systematised. The meeting would gladly give their thanks to Dr. Edward Smith for this as well as the other important paper he had laid before them, and for the advances he had made in clearing up the medical and economical questions in relation to the food of the people. It was to be hoped that his continued labours in this field would receive due public support.

The vote of thanks having been passed,

Dr. Edward Smith said that Dr. Lankester had made some valuable observations on this subject. In the first place, as to whether all nitrogenous materials were equally assimilated or digested, he would say that it was a great question, which he was anxious to have thoroughly investigated. Let them consider what had been their position lately. Till the last few years nitrogen was looked upon simply as the element which supplied muscle or flesh to the frame, while carbon supplied the fat and heat, but very curiously it was discovered by Dr. Thompson, in his experiments in the feeding of cattle, that the fattening properties of fodder were not in relation to the carbon in the food, but to the nitrogen, which was supposed to have nothing to do with the formation of fat. In the course of the experiments which he (Dr. Smith) began about six years ago, as to the effects of different foods upon the body, he ascertained that if a person took gluten or other nitrogenous matter containing very little carbon, there was an increase in the amount of carbonic acid evolved quite disproportionate to the carbon supplied by the nitrogenous food. Here, then, they had another strong proof that nitrogen acted, not only by becoming portion of the tissues of the body, but by promoting its vital actions. He had suggested to the Lords' Committee on prison discipline and dietary, that it was not possible at present to decide whether meat could be wholly dispensed with in prisons, and whether it could be supplanted by milk, which contained a large amount of nitrogen, or by cheese, which contained still more nitrogen. Those were matters which required further investigation before the final settlement of the dietaries could be determined upon. It was of the greatest moment that a society like this should feel the importance of the subject, and bring about an inquiry by which these important questions might be finally settled. With regard to cheese, it had not as yet been shown that only a certain quantity was digested; but he believed that if a person took a large portion of cheese it was not all digested. It did not, however, follow that the whole of a moderate quantity of cheese was not digested; and he had proved that on taking a small quantity of cheese, nearly the same quantity of nitrogen would be eliminated from the body, clearly showing that a small quantity of cheese would be assimilated. With reference to gelatine, he thought Dr. Lankester was in error in saying it had been shown that gelatine was not digestible. It had been satisfactorily established that gelatine was rapidly digested, very rapidly went into the blood, and very rapidly left it. The experiments of Professor Lehmann in Germany, as well as his (Dr. Smith's), showed that gelatine, after being taken four hours, eliminated as much nitrogen as was taken into the body. The only question in dispute was that raised by Bischoff and Voit, whether, as it left the body so rapidly, it could have any thing to do with forming the tissues. In his previous paper he observed that well-digested bones contained a large amount of nutritive matter. With reference to the dietaries he had mentioned, they had not merely been in use for a month or two, as Dr. Lankester had supposed, but they were the actual dietaries in use in Lancashire. In the same way dietaries had been collected from the food actually eaten by all classes of the community. Dr. Lankester had intimated that he thought these dietaries had not been made sufficiently palatable and tasty. Upon that he would say his object in constructing them was to introduce as far as possible the usual food of the population with such variations as economy would admit of; he did not go into the question of how much nourishment a man might obtain if he were in a position to spend more money upon his diet. Dr. Smith having enumerated the articles in his private dietaries, and remarked upon their variety, went on to add that there was nothing more important to be borne in mind than that there was a possibility of getting the prison diet too low. There was a disposition, at the present time, on the part of a large and influential class to lower the diet of prisons from its present scale. There could be no doubt that the large amount of mortality and scurvy which formerly existed in the prisons of this country was owing to the amount of food being too little. The Earl of Carnarvon, whilst desiring to reduce the dietary of prisoners as far as would be consistent with their health, had remarked upon the danger of the present reaction defeating its object by making too great a reduction and thus increasing sickness and mortality in prisons, and necessitating another change of the dietaries.

The Secretary announced that on Monday evening next, at eight o'clock, the third lecture of Mr. Burges's course would be delivered, and that at the meeting on Wednesday evening next a paper, by Dr. Marcet, F.R.S., "On Petroleum, its Economic Value, and a Visit to the Petroleum Wells of Canada," would be read.

Obituary.

WILLIAM HENRY HUNT has just died in the fulness of life and honour, the span of man's years, three-score and ten, having been completed by him three years ago; and as to earthly distinction, no man has received more of it from his fellows. As an artist Hunt was valued by all classes, although for different reasons. The learned in art prized his productions, as perfect examples of painting, and disregarded the modesty of their themes in favour of their unapproached excellence. No painter surpassed him in technical power applied to those themes Hunt made peculiarly his own, *i.e.* fruit, flowers, and what is called still-life. As a painter of interiors he held a high place; as a humorist he has long been recognised. The unlearned in art revelled in the fidelity and brilliancy of Hunt's pictures, their homeliness and beauty, and asked few questions as to their æsthetic merits. We rarely find a verdict so unanimously given in a man's favour at home; still rarer is it for us to know, as of this case, what is known—that a single painter became a member of a foreign academy while not a member of that of his native country. Hunt was a member of the Academy of Amsterdam—an honour most valuable to hold in the land of flower-painters of old. In 1855, at the Paris Exhibition, Hunt's works astonished all France, and every critic was loud in expressions of delight. Eleven drawings (Nos. 1031–41, *Grande Bretagne*), hardly satisfied the admiration of the French. The baptismal register of St. Giles'-in-the-Fields says the painter was the son of John and Judith Hunt, born March 28th, 1790. His birth took place at the house No. 8, Old Belton-street, now Endell-street, Long-acre. His father was a tin-plate worker and japanner, resident in that house, which is still used for the same trade. Hunt was strongly inclined towards art in his earliest youth, and, despite the objections of his parents, persisted in following it. He was literally apprenticed to John Varley, the famous water-colour painter, for a term of seven years. At Varley's house No. 15, Broad-street, Golden-square, Hunt met Mulready, who induced him to enter the Royal Academy and study in the schools of that institution. This he did for some years. In company with Mulready, Hunt was a visitor at Dr. A. Munro's house, No. 3, Adelphi-terrace, next door but one to Garrick's house, No. 5 in the same row; at this place he drew with what might be called the little Academy, and met many men of note. Hunt's first appearance as an exhibitor was at the Royal Academy, in 1807, when he contributed three landscapes, views near Hounslow, Reading, and Leatherhead. These were oil paintings and such as he exhibited at the same place in 1809, 1810, and 1811. In oil also were probably his contributions to the Academy in 1822, 1823, 1824, and 1825. The subjects were still-life, portraits, and interiors. Such subjects as the last-named were evidently to Hunt's taste in early life. We find that he received commissions from the Earl of Essex to paint some of the rooms at Cashiobury and part of the park and grounds at that place. At Cashiobury he first knew Dr. Munro. Hunt's first connexion with the Society of Painters in Water Colours (of which he afterwards became so distinguished an ornament) was in the capacity of "Exhibitor," *i.e.*, an artist invited to contribute to the Society's annual gathering, but not otherwise connected with the body. His first contributions, made to the tenth exhibition of the Society, 1814, were named "View of Windsor Castle," and "The Bell-tower, Windsor Castle." He contributed on this footing in 1815, 1819, 1824—where he appeared as an associate exhibitor in 1825, 1826, and 1827—when he became a full member. From this time he rarely failed to contribute, and his fame steadily grew. His last works were produced not many days before his death, on the 10th inst. He died of apoplexy, induced by a violent cold. His old friend and medical attendant, Mr. Wade, of Dean-street, Soho, possesses the finest collection of the artist's works, about thirty-nine in number. Hunt's contributions to the Manchester Art Treasures Exhibition were twenty-eight, to the International sixteen works.

Notes.

The Rotterdam steamer, which left that city on Tuesday evening, the 9th instant, brought the news of the total destruction by fire of the Schieland Palace, the well-known museum and picture gallery of that city.

GREAT EASTERN STEAMSHIP.—This vessel was on Wednesday last put up for unreserved sale, by auction, at Liverpool. She was purchased by the Great Eastern Steamship Company, a company which has recently been formed for the purpose of again running this vessel. The price at which she was purchased was £25,000.

Correspondence.

FRESCO PAINTING AS A SUITABLE MODE OF MURAL DECORATION.

SIR,—In the paper which I had the honour of reading before your Society on the above subject, two distinct propositions were enforced or implied. 1st. That mural decoration in general is in itself noble; 2nd. That the specific mode of mural decoration called Fresco, is practicable. In the discussion which took place after the reading of the paper, the former assertion was in no degree called in question. I had endeavoured to show that mural decoration, of which fresco is a prominent, if not indeed the most approved method, possesses the elements of greatness and grandeur; that mural painting, by virtue of its allegiance to architecture, is almost of necessity symmetric in proportion and broad in the distribution of its distinctive members and masses. I further expressed the opinion, of which indeed there cannot be the shadow of a doubt, that at a moment when architecture is obtaining renewed and extended development—at a time when our buildings are passing from an era of whitewash to an epoch of colour, the whole question of mural decoration, whether by the process of fresco or otherwise, becomes of paramount import. It is a satisfaction to know that not one of these arguments, so far as they touched mural decoration in the abstract, were by a single speaker contravened. Fresco painting, as an individual process, it was objected, may possibly have proved imperfect. It may therefore be necessary to have resort to some other expedient. "But while" said the chairman, Lord Elcho, "we admit that *fresco puro* is imperfect in itself, let us not on that account give up mural decoration altogether—that is, high art on our walls—till we are assured that no good substitute has been discovered." Thus one important conclusion of this interesting and valuable debate is, that mural decoration of some sort England must have; that she cannot get on without it in one form or another. This is a valuable concession, proving the vital character of the topics which my paper had brought into debate, and showing how urgent it is that the conflicting merits of the rival processes shall receive through the Society of Arts, or from some other competent tribunal, speedy and final adjudication.

Among the several competing processes of fresco, tempera, encaustic, and water-glass, I had intentionally concentrated my attention on the first. It seemed to me that the method of fresco, which had received in times past encomium and honour, was at the present moment falling under unjust obloquy. Furthermore, the danger appeared to be imminent that, in the somewhat blind impulse of the moment, a plunge should be rashly made into the midst of methods which, however alluring at first sight, had certainly not as yet gained the advantage of long and tried experience. Such being the critical position in which the whole subject of mural decoration was placed, I deemed that good service might be done by bringing clearly and prominently into view the facts

which favour the fresco practice. In taking this course no aggressive attack was made upon what I have termed the rival processes. On the contrary, I emphatically stated "that the more the means can be multiplied whereby national and municipal buildings may be fittingly adorned, the better." And, in retracing the line then deliberately taken, I now fortunately find not one single opinion to retract or modify. The discussion which ensued I shall now attempt to pass in review.

In the first place as to the durability of fresco. The chairman, in his admirable speech at the close of the discussion, observed that "if he had been in Mr. Atkinson's position—arguing in favour of frescoes—he would not have pointed to the chromo-lithographs published by the Arundel Society, inasmuch as the object of that society was to preserve to after ages some feeble record of those great masterpieces of early Italian art, the originals of which were mouldering and fading away." I fear that this sentence casts, unintentionally no doubt, suspicion on the fidelity of the Arundel Society's publications. These chromo-lithographs are either faithful or false. If faithful, they are trustworthy testimony to the present condition of the Italian frescoes. Happily, I know, from personal scrutiny, that these prints are substantially literal; and, possessing this knowledge, I gave them in evidence to prove the durability of the mediæval originals. When I was last in Florence, Mr. Layard, who was then taking an autumn tour through Italy, showed me the drawings which Signor Mariannecci had just made of the frescoes by Masolino and Masaccio in the Brancacci Chapel. These copies professed to be accurate transcripts, taken direct from the frescoes themselves. Within a few days I revisited the chapel, saw the artist employed by the society at his labours, and am able to testify to the fidelity of his work. It was the chromo-lithographs reproduced from these very drawings to which I pointed in proof of the durability of Italian frescoes. These great historic works, I then stated, had been painted more than four hundred years, and yet, notwithstanding that the Carmine Church was destroyed by fire, this side chapel and its far-famed mural decorations stand intact. To this striking example many more might be added. It is true that frescoes exposed to the open air; that frescoes down the face of which the rain has trickled from broken roofs; that frescoes which have suffered actual outrage from soldiers or mobs of the people, are more or less in ruin. How, indeed, could it be otherwise? But, on the other hand, works which have received fair treatment remain almost in their original brilliancy, even to the marvel of all beholders. Therefore, with reason has the method of fresco been ever deemed in itself most enduring.

And in this place it may be well to say just one word by way of definition—fresco is a painting on a fresh, that is a wet, wall of mortar. Now, it was the practice of the middle-age painters to re-touch their fresco walls and works, when hard, by the secco, that is, the dry process; therefore, say certain English objectors, these pictures, when re-touched, are no longer frescoes. This conclusion is too severe. A picture originally laid down in fresco does not cease to be fresco when it receives a few dry touches. It is fresco still, and such it has been always deemed; therefore, all cavilling on this small point may be silenced. But out of this objection one satisfactory conclusion can be drawn. Of the two processes—fresco and secco—fresco, by common consent, is the most enduring. Therefore, if secco pictures, painted by Egyptians in their temples, and by Romans in the houses of Pompeii, have fairly held their ground, how much more stable would these works have proved if through the manipulation of fresco they had been embedded in the very structure of the wall. My reply, then, to these objections is, that if secco be good, fresco is still better.

That the restored process of fresco, as practised at Westminster, does not prove so lasting as the original method of the middle ages is our misfortune, and possibly our fault. The cause of the rapid decay of our pictures is still a mystery, chiefly, however, because we have not taken the trouble to inquire into the facts of the case. The process of fresco is simple; lime and sand are the only elements which go to make the mortar, and the pigments used in the actual picture should be limited to a few uncompounded earths and minerals. Yet the means, though thus simple, are apparently for us too difficult. Surely it ought to be humiliating to find that the comparative empiricism of the middle ages is of more practical worth than the vaunted science of our own times. But modern fresco, unfortunately, does not stand alone in frailty. Our artists have notoriously, in the matter of materials, committed the most melancholy blunders. Many of the oil paintings of Sir Joshua Reynolds are in ruin, and the landscapes of Turner, when touched by the cleaner, are in danger of falling to pieces. It surely then would be more becoming on our parts to plead want of knowledge and experience, rather than to presume to pass hostile judgment upon the noble art of fresco, which, in skilled hands, has won a victory over time and secured an immortality of fame.

Our English climate, our town smoke, and the chemical products of gas consumption, are usually adduced as reasons against the adoption of fresco in this country. These difficulties no doubt stand in the way of fresco, and so likewise do they prejudice every form of art reared in the land—architecture through its stone sculpture in its marble and bronze, oil and water-colour paintings in the paper and pigments. But however fatal these agencies may be in general—and I cannot but think that their destructive action has been greatly exaggerated—it is important to mark that they have little or no bearing on the facts now brought into discussion. The destruction of the frescoes in the Houses of Parliament has not been wrought so much by external as by internal causes. The atmosphere may not have been of the purest, and yet can it safely be asserted that the air which noble lords and honourable members have breathed with comparative impunity, has proved equally innoxious to the constitutions of the pictures. A close inspection of these works at any rate indicates, as I have said, internal rather than external agencies of destruction. Accordingly in the construction of the walls, in the constitution of the mortar, in the quality of the pigments, and in the mastery or otherwise of the manipulation, must we expect to find the real causes of premature decay; and such causes, be it observed, can scarcely be deemed irremediable in the inherent nature of things; rather are they amenable to inquiry and susceptible of removal. Moreover, as stated in my paper, though certain of our modern frescoes have perished, others have survived. Even in the Houses of Parliament some works and specific colours have stood firmly. Again, frescoes executed in other parts of the metropolis are unimpaired. The great mural painting in Lincoln's Inn, and smaller works in Little Holland House, all executed by Mr. Watts; also a fresco painted by Mr. Armitage, some years since, at Islington, are severally uninjured. Consequently the causes of destruction, whatf ever they may be, are partial and not universal, and i partial, then in some sense accidental; and if both accidental and partial, certainly not inherent in the constitution of fresco itself, but incident to the inability of modern practitioners. Architects, stonemasons, plasterers, colourmakers, and artists will probably have to share the censure between them. Again, the conclusion comes as inevitable—we may fairly blame ourselves, but not with justice fresco itself.

Having said thus much on the durability of fresco, I would now add a word on the inherent facility or difficulty of the execution. The statement that the plasterers of Mr. Dyce and Mr. Herbert died mad, as the result of the constant worry to which they were subjected, is, I believe, capable of another construction. The further assertion, that Mr. Herbert himself "had nearly been driven mad by the trouble and annoyance which the old

system of fresco caused him," is for the world a more serious matter. Still, against all such appeals to our sympathies, I may be permitted to say that as far as the experience of past times has come down to us, we have no reason to believe that any middle-age plasterer or painter, having the advantage of a sane mind to start with, was driven mad by the duties of his calling. Michael Angelo, we are told, shut himself up in the Sistine, and for months painted at the ceiling, lying on his back, and then came out, the greatest achievement of his life accomplished, and gloried in fresco as the grandest of arts. It is indeed astounding to observe with what unconscious simplicity our modern men, in their condemnation of fresco, furnish a scale whereby to measure their individual powers. But the artists of the middle ages were giants. There are still, however, a few painters among us who do not flinch from the arduous task which brings its commensurate recompense. Mr. Armitage, it is well known, is so enthusiastic a disciple of the fresco art, that he executed, at Islington, works at his own cost. Mr. Watts, fired by like ardour, painted a noble picture, without promise of reward, for the benchers of Lincoln's-inn, and both gentlemen would, I believe at the present moment gladly take a commission in fresco, without fear of the calamities which have visited the mural works at Westminster. In short, the difficulties vanish before experience. The Italian painters, we well know, were impeded by no discouragements, and their fresco achievements remain as the best monuments to their genius.

Lastly, a few lines must be devoted to the rival processes; and firstly, I will speak of the German method of water-glass. This is so completely a foreign invention, that the mixture "water glass," is imported in bottles, filled and corked in Berlin. Should this manufacture in the Prussian capital become, by any fatality, closed, our British artists, it may be feared, would be put to their wits end. Such a position is rather un-English, and has, certainly, not the recommendation of dignified independence. Comparatively little, indeed, is known of the process any way. Dr. Fuchs wrote a pamphlet, in Munich, nine years since, which is still a text-book to the method, yet since his time the manipulation, and probably the constituent elements of the new vehicle, have undergone modifications little less than radical. For example, at first the practice was to mix the paints in the water glass, but this "liquid flint" having clogged the brush, the "glass" or "flint" is now left out, and the decoction simply used as a lotion, whereby a fugitive tempera picture is sought to be permanently fixed upon the wall. Again, Dr. Hofmann, a prime authority in these matters, holds the opinion that the water glass, which is spread over the picture, should effloresce, as a proof of its efficacy. But, on the contrary, Mr. Maclise, the great practical exponent of the system, writes to Lord Elcho, that he himself prefers that this efflorescence should not take place! These diversities of opinion and practice are sufficient to show that this much-exalted method still rests in the dubious and vacillating region of experiment. Well, then, might Mr. C. H. Smith close his practical remarks by the decisive judgment "that the water glass process had not, as yet, been sufficiently tried to warrant its general adoption."

Then as to the question of the superior durability of water-glass, we are as yet living in its early days, and cannot possibly form any opinion which has the advantage of experience. When a century, or rather after four centuries, shall have passed away, our remote descendants may be able to determine which of the two methods—fresco or water-glass—is best fitted to withstand the ravages of time. Mr. Purdie, in the course of his eminently practical remarks, gave utterance to a sentence which certainly sounds as the doom of the recent invention. "The more impervious," said Mr. Purdie, "the surface of a picture was, the more liable was it to be affected by the damp from behind. The consequence was that the damp from behind carried away the surface of the picture." Now, in this ingenious method of water-glass, the fixity of the work actually depends upon making the surface of the picture impervious as by a varnish. The danger of varnishing an oil painting before it is thoroughly dry is known to every artist. The like, and, indeed, a tenfold greater peril, attends the hermetically sealed surface of the painted wall, which contains within its substance salts, fluids, and gases, which, if denied free escape, will make for themselves a road through violence. As to yet another rival process, termed, we may hope only facetiously, "spirit fresco," it surely is not necessary seriously to speak. The further, indeed, we pursue this question, the more evident does it become that in forsaking the ancient fresco, the arts are likely to fall the victims of a series of nostrums, each to be tried in turn, seductive at the first venture, but abortive in a dearly-bought experience.

Such being the sad perplexities to which the practice of mural painting is reduced, I deemed, as I have already said, that some service might be done by once again recounting the evidence which favours the art of time-honoured fresco. The grandest works which the world knows, such as Michael Angelo's ceiling of the Sistine, are imperishable in this process. The great artists whom history delights to honour—Masaccio, Ghirlandajo, Signorelli, Raphael, Annibale Carracci, and Domenichino, found this noble method a worthy instrument for the expression of lofty thought. Therefore I say, let us pause ere we condemn that which the voice of history has so loudly and unanimously approved. The final issue of the discussion now commenced, it were, perhaps, premature and presumptuous to anticipate. This, however, may with confidence be asserted, that to permit questions so grave as those here in debate to remain in their present absolute confusion, were on our part little less than culpable. In conclusion, it would surely, in the words of Lord Elcho, "be a pity that fresco-painting should be abandoned without a full and fair inquiry." "He would, therefore," continued his lordship, "enforce as far as he was able the suggestion that the Society of Arts should appoint a good, practical committee, in conjunction with the Institute of British Architects, the Royal Academy, and other bodies, who might go carefully into the subject." When such a committee or commission shall be constituted, the object which I had in view in bringing my views before your notice will be attained.—I am, &c., J. Beavington Atkinson.

Frescoes.—Sir,—I think it would be a good plan, where the frescoes are quite destroyed, to cut out the plaster a sufficient depth, and put up a sheet of plate-glass, the size of the panel, ground, but not polished, on the outer surface only. This would effectually prevent any damage from the wall itself, and then the design may be either executed in oil-painting, or tempera and silicate of potash. I am satisfied, from the way my walls effloresce, now after four years, that there is great danger from behind.—I am, &c., Henry C. Lacy.

M. Vial's Process of Engraving.—Sir,—We think it due to Mons. Vial to correct a misapprehension which arose on the reading of his paper, owing to his neither understanding nor speaking our language. When asked how many impressions he had ever taken from one plate, he replied truly, 750, but had he properly understood the purport of the question, he would have added (as he afterwards informed us) that he had never had any occasion to print more, but the printer tells him that the plates will print many thousands, and that if submitted to the "acierage" process they would yield from 10,000 to 20,000 impressions. The reason why the plates experimented upon before the Society would not yield good impressions at once was, that in his anxiety to get the copper off the surface quickly, so as not to detain the Society longer than necessary, he employed some emery powder, which had the effect of filling up the lines, so

that they would not hold the ink. On the printer's cleaning out the lines next morning with a brush, the sketch was found to be faithfully engraved and the plate gave very fair proofs, some of which we have forwarded to you. With regard to the question as to the absence of lateral biting, we are perfectly willing to submit a plate to any member who will undertake to make a microscopic examination of the lines and communicate the result to the Society, as suggested by Mr. Wentworth Scott.—We are, &c., DAVIES & HUNT, English Agents of M. Vial.

MEETINGS FOR THE ENSUING WEEK.

MON. ...R. Geographical, 8½. 1. Mr. Gifford Palgrave, "Journey through the Interior of Arabia, from Gaza to El Kathif, on the Persian Gulf, and thence to Oman." 2. Mr. George Clowes, jun., "Journey along the Western Shore of the Dead Sea, from Jebel-Usdum to Ain-Jidi."
Medical, 8½. Dr. Edward Smith, F.R.S., "The Evolution of Carbonic Acid by the Lungs and Skin, and other Phenomena of Expiration and Excretion, under the influence of various agencies."
R. Academy, 8. Mr. R. Westmacott, R.A., "On Sculpture."

TUES. ...Med. and Chirurgical, 8½.
Civil Engineers, 8. Discussion upon Mr. Sopwith's paper, "On the Mont Cenis Tunnel."
Zoological, 9.
Ethnological, 8. 1. Rev. T. W. Farrar, "On Ethnological Traditions." 2. Mutee Cumara Swamy, "On the Ethnology of Ceylon."
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Experimental Optics."

WED. ...Society of Arts, 8. Dr. Marcet, F.R.S., "On Petroleum, its Economic Value, and a visit to the Petroleum Wells of Canada."
Geological, 8. 1. Mr. J. Wyatt, F.G.S., "On further Discoveries of Flint Implements and Fossil Mammalia near Bedford." 2. Mr. E. Ray Lankester, "On the Discovery of the Scales of *Pteraspis*, with some Remarks on the Cephalic Shield of that Fish." Communicated by Prof. T. H. Huxley. 3. Mr. G. E. Roberts, "On some Remains of *Bothriolepis* from the Upper Devonian Sandstones of Elgin." Communicated by Prof. J. Morris.
Archæological Assoc., 8½. 1. Mr. Cuming, "On a Seal of the Crewkerne Grammar School." 2. Mr. Wentworth, "On Heath Old Hall."

THUR. ...Royal, 8½.
Antiquaries, 8.
Philosophical Club, 6.
Artists and Amateurs, 8.
Royal Inst., 3. Prof. Tyndall, F.R.S., "On Experimental Optics."

FRI. ....Royal Inst., 8. Mr. J. Prestwich, F.R.S., "On the Quarternary Flint Implements of Abbeville, Amiens, Hoxne, &c., their Geological Position and History."

SAT. ...Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

Patents.

From Commissioners of Patents Journal, February 12th.

GRANTS OF PROVISIONAL PROTECTION.

Animals, preparing food of—60—D. Pidgeon and W. Manwaring.
Armour-plates—265—H. Bessemer.
Belt clasps, bracelets, &c., fastenings for—273—J. O. Winkles.
Blinds, &c., raising or lowering—174—J. Sewell.
Bolting mills—220—R. A. Brooman.
Bricks, &c., preparation of clay for—196—J. Platt and W. Richardson.
Casting, moulds, &c., for—190—D. Y. Stewart.
Cast iron, manufacture of articles from—153—N. McHaffie.
Charcoal, animal—283—E. Beanes.
Clasps, &c., belt—184—J. H. Brierley.
Clocks, application of magneto-electricity to—169—F. J. Ritchie.
Clothes hanging apparatus—289—A. J. Walker.
Coal, stone, &c., machinery used in getting—267—J. G. Jones.
Coal, stone, &c., machinery used in getting—158—G. E. Donisthorpe.
Coal, working of—90—C. Bartholomew.
Colours, manufacture of—200—E. Lucius.
Drama, &c., apparatus used in—41—J. H. Weston and C. Morton.
Fabrics, spinning—188—G. de Vanssay.
Fabrics, weaving cut pile—222—W. Norton.
Fire-arms, &c.—257—J. C. Haddan.
Fire-arms, breech loading—259—R. Brazier.
Fire-arms, breech loading—271—E. Harrison.
Furniture, securing to floors—172—F. W. Burton.
Gas, illuminating—281—G. Hammond and J. W. Kemp.
Gauges, pressure and vacuum—159—H. Brockhurst and J. Sullivan.
Glass, manufacture of—277—R. A. Brooman.
Hammer, atmospheric—206—W. D. Grimshaw.
Hats, &c.—210—M. S. McCallum.
Heating apparatus—263—W. Clark.
Hinges, hook—275—F. E. Martineau.
Hydraulic machines, cylinders of—269—W. N. Hutchinson.
Malt, corn, &c., kilns for drying—194—T. Bright.
Materials, machinery for hoisting—122—W. Balmforth and F. Robson.
Metals, &c., tools for cutting—287—F. W. Webb.
Nails, horse-shoe—232—F. Parkes.
Oil, &c., presses for the expression of—251—J. Marshall.
Organs—216—J. Stuttaford.
Organs, &c.—162—M. Henry.
Peat, &c., apparatus for treating—192—F. North.
Petroleum, &c., lantern and lamp for burning—164—J. T. Hall.
Projectiles—261—J. Whitworth.
Pumps, steam—198—W. E. Newton.
Railway engines, &c., wheels for—180—G. Smith, jun.
Railway waggons—239—J. Henson.
Rings for scarfs, &c.—178—R. E. Eades.
Sewing machines—168—J. H. Johnson.
Sewing machines—176—W. Clark.
Ship-building—224—P. Christie.
Shop fronts, protection for articles in—3239—H. Emanuel.
Spinning frames, &c., spindle bands used in—129—R. Newton.
Steam engines, regulating the speed of—214—W. E. Newton.
Steam engine, rotary—228—W. E. Gedge.
Steam vessels, paddle wheels for—189—T. Markland, T. Williams, and J. B. Sheridan.
Stays, manufacture of—166—C. Heptonstall and W. Lunn.
Straw, &c., manufacture of paper from—202—J. Piddington.
Sun blinds—140—G. Jenner.
Tables—212—S. Vaile.
Telegraphs, covering wire for—3151—J. A. Bailey and J. J. Speed.
Textile fabrics, pressing, &c.—73—J. Clegg, J. Clegg, and J. Rowley.
Tobacco, machinery for cutting—230—T. Butterworth.
Vessels, jib crane for loading, &c.—208—S. Moore.
Water, apparatus for raising, &c.—3162—V. De Stains.
Wines, spirits, &c., preservation of—249—B. I'A. Bromwich.
Wood, apparatus for cutting—149—J. Hamilton.
Zinc white, manufacture of—218—G. Darlington.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Paddle wheels, feathering—318—G. T. Bousfield.

PATENTS SEALED.

2014. M. H. Lishman.
2026. E. Lord.
2043. J. S. Crosland.
2048. H. Robinson.
2049. T. Dobb.
2051. J. Yates.
2053. R. A. Brooman.
2055. C. H. McCormick.
2137. W. Whitworth and J. Wrigley.
2139. A. Agnew.
2147. F. A. Braendlin.
2159. W. Clark.
2192. J. Rowell.
2233. M. A. Muir & J. McIlwham.
2330. H. Hutchinson.
2448. E. Jones.
2597. C. Fusnot.
2659. W. Firth, S. Firth, and J. Sturgeon.
2760. W. D. Allen.
2809. G. Haseltine.
2810. B. A. Murray.
3006. H. Wilde.
3113. A. Reid and G. Rydill.
3183. C. Humfrey.
3198. H. A. Bonneville.

From Commissioners of Patents Journal, February 16th.

PATENTS SEALED.

2036. J. Smith.
2042. T. Loftus.
2052. R. A. Brooman.
2058. C. Sonnhammer.
2070. J. Platt and W. Richardson.
2071. J. Platt and W. Richardson.
2073. C. D. Hammond.
2078. R. A. Brooman.
2079. W. Evans.
2081. E. Pope.
2082. J. B. C. Lange.
2084. R. A. Brooman.
2086. R. A. Brooman.
2090. W. Benson and P. W. Greenwood.
2100. G. E. Lewis, H. Walker, and J. B. Wayne.
2119. C. Richard.
2122. G. Davies.
2168. E. Collier.
2181. A. V. Newton.
2277. J. McEwen.
2047. W. E. Newton.
2798. F. Testuz.
2920. G. S. Kirkman.
3076. W. C. Page.
3100. W. L. and T. Winans.
3241. A. Turner.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

334. J. G. Jennings.
346. N. Thompson.
351. W. Oldfield.
384. G. J. Wainwright, C. T. Bradbury, & J. Lawton.
395. N. Nussey.
370. J. S. Blake, G. C. Lingham, and J. Nicklin.
486. J. Young.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

431. J. Lawson and S. Cotton.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, FEBRUARY 26, 1864. [No. 588. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

MARCH 2.—"On the Verification of Olive Oil, by means of its Cohesion Figure." By CHARLES TOMLINSON, Esq., Lecturer on Science at King's College School. On this evening ROBERT BENTLEY, Esq., Professor of Botany in King's College, London, will preside.

MARCH 9.—"The Science of Fish-hatching." By Frank Buckland, Esq., M.A., F.Z.S., late 2nd Life Guards.

MARCH 16.—"On the Organisation of the Corps Impérial des Ponts et Chaussées in France." By GEORGE R. BURNELL, Esq.

CANTOR LECTURES.

The fourth lecture of Mr. Burges's course will be delivered on Monday next, at eight o'clock.

FEB. 29.—LECTURE IV.—*Iron and Brass.*—Antique bronzes; Mediæval ditto; modern French bronzes (Barbédienne); Mediæval dinanderie; modern ditto (Hardman, Hart, &c.); Mediæval and Renaissance wrought iron; modern ditto; cast iron.

MAR. 7.—LECTURE V.—*Gold and Silver.*—Antique and Mediæval plate; modern ditto (Elkington); Antique and Mediæval jewellery; modern ditto; Antique and Mediæval coinage; modern ditto.

MAR. 14.—LECTURE VI.—*Furniture.*—Mediæval furniture, oak and painted; Renaissance; 16th and 17th centuries; modern.

MAR. 21.—LECTURE VII.—The Weaver's art; Mediæval, Eastern, modern.

INSTITUTIONS.

The following Institution has been received into Union since the last announcement:—

Stockport Mechanics' Institution.

SUBSTITUTES FOR GUTTA PERCHA.

Sir W. Holmes has forwarded to the Council, from Demerara, some specimens of a gum termed "Balata," the produce of the Bullet tree (*Sapota Mulleri*), which grows in that colony, and which, he states, possesses the properties of gutta-percha, and may be used as a substitute for it. The specimens include not only the inspissated juice, but also a bottle of the juice itself. Mr. Ondaatjie, colonial surgeon, has forwarded to the Council, from Ceylon, a specimen of the *Alstonia Scholaris*, which he states may be used as a substitute for gutta-percha. It is stated to possess the same properties and is as workable as the latter. It readily softens when plunged in boiling water, is soluble in turpentine and chloroform, receives and retains impressions permanently, and is adapted for seals to documents. The tree abounds with milky juice, like the gutta-percha, has a fleshy bark and porous wood, and belongs to the natural order Apocynea. The natives believe that the tree is very poisonous, and class it among their virulent poisons, but Mr. Ondaatjie states that his experiments with the juice, &c., have proved the contrary. These specimens are sent in response to premiums offered by the Society for the discovery of a substitute for gutta-percha.

Proceedings of the Society.

CANTOR LECTURES.

FINE ARTS APPLIED TO INDUSTRY. BY W. BURGES, ESQ.

THIRD LECTURE, MONDAY, FEB. 22.—POTTERY.

Mr. BURGES began by remarking that the history of pottery had been so often written, and the art itself had attained to so great a degree of excellence, that there was very little to say about it that would be new; the great drawback being the high prices, which placed the better sorts of majolica and pottery beyond the reach of the public generally, while there was still a vast field for improvement in the pottery of every-day life. The lecturer then went into the subject of the Greek painted vases, distinguishing the different styles and epochs of their manufacture, and drawing attention to the lightness of the material and the beauty of the drawing, especially those of the best period. Mr. Battam's imitations were noticed, and a suggestion put forth that the ware might possibly be advantageously employed for dessert services and flower vases. The Roman Samian ware and the celebrated works of Wedgwood were the next subjects touched upon, attention being called to the more harmonious tints of the early specimens as compared with the more modern productions. Mr. Burges next proceeded to give a short history of the celebrated Italian majolica, more especially the productions of Pesaro, Urbino, and Castel Durante, with short notices of the works of Luca della Robbia, Bernard de Pallissy, and of the Henry II. ware. These were compared with the modern productions of Mr. Minton. This was followed by a short notice upon tiles, more especially those commonly known as encaustic, of which the Chertsey ones were pointed out as the best examples of medioeval art applied to the manufacture. Godwin, of Lugwardine, near Newport, in Wales, was designated as the best modern maker of encaustic tiles resembling the ancient ones. The last subject treated on was porcelain, the name being supposed to have been derived from the resemblance of the china to a substance (believed to be mother-o'pearl) mentioned in mediæval inventories. The new ware was introduced into Europe by the Portuguese, in the beginning of the 16th century, but it was not until the middle of the succeeding one that it was first made at Dresden; other manufactories were then established at Sèvres, in France, and at Bow and Chelsea, in England. The lecturer concluded by drawing attention to the beautiful colours of the Rose du Barri and blue turquoise, as produced by Minton and Daniell, and expressed a wish that means might be found, by the application of printing, to reduce the cost of all these beautiful manufactures. On the

table was a collection of specimens illustrative of the various branches of manufacture referred to by the lecturer. Mr. Wareham lent some specimens of old china; Messrs. Battam lent some Etruscan vases, ancient and modern, and some porcelain, imitating the Limoges enamel. Messrs. Phillips contributed some modern majolica and porcelain; Messrs. Daniell some porcelain from their manufactory, known as that of Rose of Coalport; Messrs. Goode lent some specimens of modern majolica and porcelain, of various kinds, manufactured by the Messrs. Minton; also some ancient majolica from the private collection of Mr. W. J. Goode, and some drawings on porcelain by the latter gentleman, after Holbein and Bartolozzi. To all these contributors the thanks of the Society are due.

Eleventh Ordinary Meeting.

Wednesday, February 24th, 1864; Dr. A. W. Williamson, F.R.S., Professor of Chemistry, University College, London, in the chair.

The following candidates were balloted for and duly elected members of the Society:—

Cameron, Robert M., Canning-house, Edinburgh.
Defries, Daniel N., 5, Russell-place, Fitzroy-square, W.
Grant, Albert, Roseau-house, Addison-road, W.
Huntsman, Henry, 126, New Bond-street, W.
Kempton, Henry Tattersall Knowles, 17, Cavendish-place, W.
Travers, Archibald, 19, St. Swithin's-lane, E.C.
Westmacott, Percy, Whickham, Gateshead-on-Tyne.

The Paper read was—

ON PETROLEUM, ITS ECONOMIC VALUE, AND A VISIT TO THE PETROLEUM WELLS OF CANADA.

By William Marcet, M.D., F.R.S.

While travelling through Canada, during the months of August and September of last year, I visited the petroleum wells of that country, and availed myself of the opportunity to obtain all the information I could about them. Shortly after my return, I requested to have the honour of communicating a short account of these observations to the Society of Arts, when it was suggested that I should treat the subject at somewhat greater length. I accordingly entered upon an inquiry into the present state of the petroleum, or rock-oil trade, and its prospects, and I also undertook a series of experiments on the illuminating power of this substance, with a view to endeavour to contribute thereby to our knowledge of its economic value.

Irrespective of my own observations and inquiries, the *Weekly Philadelphia Coal-oil Circular*, containing a digest of all that is published in America on the subject of petroleum, has afforded me an important means of information. My distinguished friend, Professor Lesley, of Philadelphia, has recently issued an elaborate essay on petroleum, to which I shall have an opportunity of referring; and many other of my friends engaged in business in London, have kindly afforded me their assistance on the present occasion.

Petroleum has been known from a very remote period; Herodotus* describes a bitumen spring in Zante, one of the Ionian Islands, which was probably used for embalming. Diascorides informs us that rock-oil was collected in Sicily, and burnt in lamps at Agrigentum. The famous petroleum springs of Baku, on the shores of the Caspian lake, have been known from the time of Zoroaster. In Italy, the oil wells of Parma and Modena date back nearly two centuries, the year 1640 being assigned to their discovery. The springs of Amiano have long lighted the streets of Genoa. In France, oil springs have been known from time immemorial at Clermont and Gabian, South of Vesuvius, a spring of petroleum bubbles up through the sea. In the island of Trinidad, in the West Indies, petroleum indulges in strange freaks; it not only exudes from wells and springs in the usual way, but it has formed a lake between two and three miles in circumference, warm, and liquid in the centre, where it is always slowly boiling, but thickening as it recedes from this point, till at the margin it is sufficiently cold and solid for persons to walk upon it at pleasure when the weather is cool; and when the weather is hot they have an opportunity, as stated in the *Philadelphia Coal-oil Circular*, of learning by experience how flies feel in molasses. Masses of bitumen are scattered over the ground in the vicinity of the lake, and stand out amongst the foliage like rocks of brilliant jet.

We are principally interested in the American petroleum, as hardly any other kind has been hitherto consumed in England. Although it was ascertained that this oil was known to the aborigines on the invasion of America, it was not until after 1853 that it came into general use; there was then a well, or pit, on the premises of Messrs. Watson and Co., lumber dealers, in Titusville, on the surface of which from time immemorial oil had been floating; this was collected for medicinal purposes by absorbing it in blankets. Dr. Brewer conceived the idea of using this oil for lubricating and illuminating purposes. This was the beginning of a business which now amounts in value to several millions of dollars per annum. Dr. Brewer induced a company of gentlemen to take an interest in the undertaking, and the Pennsylvania Rock-oil Company was formed in the autumn of 1854, with a nominal capital of 300,000 dols.; this corporation was regarded, however, as a fancy stock concern, and the shares soon declined to a merely nominal value. In the winter of 1854 Professor Silliman analysed the oil, and reported so favourably thereon, that large investments were made in the stock of the Pensylvania Company; but the enterprise languished for several years, until in 1858 Mr. Bowditch and Col. Drake, who had been sent out to work the property, conceived the idea of digging a well on the lands which had yielded so promising a surface show of oil, and were rewarded by pumping first 400 and afterwards 1000 gallons of oil per day, as stated by Professor Lesley.

Since that time adventurers flocked to Oil Creek. Some were successful, while others, exhausting all their funds, were compelled to relinquish their hopes. One spring was sunk, in 1850, from which flowed, without pumping, about fifty to sixty barrels per day; this was considered marvellous.

In 1861 the first large flowing well was struck, which ran about 1000 barrels per day, but before arrangements could be made to secure this source of wealth, the well caught fire, and twenty-two persons were burnt to death. Shortly after a well was dug on the land of Brewer, Watson, and Co., which yielded the enormous quantity of 2,500 barrels per day. Another, and another, flowing well was struck, until the produce became so large, that the market, in the infancy of the trade, was overstocked. It was estimated that the production in the winter of 1861-2 was 15,000 barrels per day, and the price of the oil declined to ten cents (5d.) per barrel at the wells. The consequence of this was, that the low price favoured the introduction of the oil into domestic use, and has created an export demand which has constantly been increasing. Thousands of wells have been bored in the Oil Creek Valley, Pennsylvania, but it is estimated that not more than 15 per cent. have been productive. One was bored to the depth of 1006 feet (the deepest well of all), but it produced no oil. Boring for oil is, in fact, a lottery; some obtain rich prizes, but more are ruined; and the valley is dotted with dilapidated derricks—the melancholy monuments of departed hopes and ruined fortunes.

In illustration of the uncertainties attending the search

* Book VI., Chap. cxix.

after oil, the following incidents are related in the *Philadelphia Coal-Oil Circular*, from which the above has been extracted:—One well was bored with the usual centrebit, to a considerable depth, without any oil being found; on withdrawing the bit and putting in the rimmer to widen the well, a vein was struck at the side—the bit had just missed the vein—and the well would have been a failure had not the orifice been enlarged. A well was at one time bored which promised to be very productive, flowing a large amount of oil; the owners of the well not being ready to collect it, a plug was driven into the pipe, upon the removal of which, when tanks had been built, the oil had disappeared, and the hopes of the proprietors faded away "like the baseless fabric of a vision."

The result of an inquiry into the prospects of the petroleum wells, although in no way discouraging, is not so promising as might have been expected. The following is extracted from the *Philadelphia Coal-Oil Circular*, for September 21, 1863:—"It is but natural that a feeling of doubt, on the present supply of petroleum lasting, should exist in the mind of all those engaged in the trade—a short six to eighteen months has, with a few exceptions, been the average life-time of flowing wells; the latter portion of their time of running is also marked by a decrease of at least three-fourths of the original flow; this, and the fact that all the wells struck have shared the same fate, is what tends to impair the confidence of many; nowithstanding this, we can see but little material difference in the amount produced 12 years ago and now; old wells have been abandoned and new ones struck; the result at Oil-creek, so far this season, has been three first-class wells; in the second class may be counted two yielding about 500 barrels a day, and several others approximating to that figure; others have been struck averaging from 75 to 150 barrels per day; in addition to this may be mentioned many new pumping wells, and many of the old abandoned ones that are now pumping or flowing from five to twenty barrels.

"The boring of wells is at present nearly confined to a narrow basin, about 80 rods wide; probably not less than 500 wells have been sunk during the present season in this territory. It is estimated that the total number of wells now down, or in process of being sunk, will average three to an acre. This process of honey-combing the land lets out the subterranean gas, which gradually fails to force up the oil; it also admits water into the wells, effectually stopping or drowning them. In many cases water has flooded good flowing wells, thereby rendering them worthless."

Although this report does not exhibit the Pennsylvanian wells in a condition of increasing prosperity, they keep up their supply, and the writer expresses a confident hope that an improved method of going to work will increase the produce.

Let us now consider the state of the petroleum trade in our own country. Both the total exports of rock-oil from America, and the imports into this country, have increased in a remarkable degree in the year 1863. The following statement respecting petroleum appears in Messrs. Rose, Graham, and Wilson's annual market report for this year.

Actual export from America to all parts (1863)	27,139,467	gals.
,, ,, (1862)	10,318,658	,,
Import into London (1863)	98,000	barrels
,, ,, (1862)	28,335	,,
,, Liverpool (1863)	145,000	,,
,, ,, (1862)	80,000	,,
Present stock in London (refined)	23,164	,,
,, ,, (crude)	3,199	,,
,, Liverpool (all kinds)	70,000	,,

Average prices of refined in London:—January, 2s. 5d.; February, 1s. 11d.; March, 1s. 6½d.; April, 1s. 7¾d.; May, 1s. 10d.; June, 1s. 11d.; July, 2s. 2½d.; August, 2s. 3½d.; September, 2s. 6½d.; October, 2s. 4¼d.; November, 1s. 11½d.; December, 1s. 11d.

In addition to the above these gentlemen observe that the idea generally entertained of petroleum ultimately becoming an important article of commerce, has been more than realized during the past year. Not only has the consumptive demand steadily increased to the extent of its now being greater than that of any other burning commodity, but the great fluctuations in prices have laid bare a field for speculation which has been eagerly embraced.

A firm of London brokers informed me that during the end of November and part of December last they sold no less than £100,000 worth of petroleum, for consumption and speculation.

Since last month a new supply of rock-oil has found its way to our market, as we are informed, in the *Times* of the 6th January, that 280 tons of this substance had just arrived from Wallachia, on account of the Earth-oil Import Company, who had contracts extending over this year for the delivery of about 20,000 tons, of a quality guaranteed to be at least equal to that of Pennsylvania.

Again, a Wallachia Petroleum Company has just been advertised, who have entered into arrangements with the Earth-oil Import Company for the purchase of their plant. Thus it is, that even should the American supply of rock-oil diminish, our trade will probably in no way suffer from it.

Petroleum, when burnt in one of the lamps, which I believe to have been originally patented by Young, gives out a fine light with a tinge of yellow in it, and is not nearly so dazzling as gas. The products of the combustion of the oil have no perceptible smell, indeed, they are less deleterious than those of any other illuminating material. Petroleum, as stated by Dr. Frankland in a lecture at the Royal Institution, gives off less carbonic acid than other lighting bodies, and much less than coal-gas; the amount of light emitted varies in great measure according to the surface of the flame; if the wick has carefully been trimmed, the flame spreads out much like that from a fish-tail gas-burner, but as the oil burns off the flame becomes smaller and duller, giving out less light, till finally the wick begins to char, and the light emitted is much diminished.

With the view of undertaking some experiments on the lighting power of petroleum, I had a photometer made by Mr. Sugg.

The instrument consists of a large box, divided by a screen into two compartments. There is a moveable stage in each compartment, on which the lights are placed. The screen consists partly of a disk of paper, plain in the centre, with an oiled zone round it. When both lights shine with an equal power, on both sides of the disk, the centre becomes invisible, but if the lights should be of unequal strength the centre is clearly seen. By moving the stages, both sides of the disk can be equally illuminated, and the relative distance between the lights and the screen, will show their relative illuminating power; bearing in mind that the intensity of light varies with the square of their distances. Two mirrors are placed at a certain angle behind the disk, enabling the observer to view both sides of it at once, and judge with great accuracy of the relative power of the lights under trial.

It must not be supposed that I claim the merit of being the first to inquire into the illuminating power of petroleum; a very interesting and elaborate paper on this subject, by Messrs. James Booth and Thomas Garret, will be found in the *Philadelphia Coal-oil Circular* of the 13th April, 1863; and another by Mr. Charles Wetherell, is published in the same journal of the 3rd January, 1863. Dr. Frankland has also made experiments on this subject, and his results were communicated last year to the Royal Institution.

The petroleum and lamps I used, were procured from the Metropolitan Light Company, in the Strand. A lamp

was provided, with a flat wick six-eighths of an inch broad; it was filled with petroleum, and lighted. I ascertained the light to be equal to 6.5 sperm candles; one half of the oil was now removed from the lamp and the lighting power of the flame again tested, when it was found equal to 6·3 sperm candles; finally, the remaining bulk of oil was again reduced to one half, when the lighting power of the flame was diminished to four candles, or only about two-thirds of that it possessed when the lamp was full. With this small quantity of oil the wick rapidly charred, and the flame assumed an irregular shape.

From this experiment it may be concluded, that a petroleum lamp must not be much less than half full to give out its best light.

The shape and surface of the flame was also found to affect materially the amount of light emitted, the best shape being that expanding like a fan, and flat at the top; when tapering into a point at the top, the light was not nearly so good. The shape of the flame depends on the trimming of the wick, the best mode of trimming being to cut the wick straight across, and bevel the edges laterally, so as to give the top of the wick a slightly convex shape laterally; with a wick an inch broad, the corners may be just cut off, to prevent the risk of the lamp chimney breaking; a little practice will quickly enable anybody to prepare the lamp in the proper way.

The light of different lamps varies according to the size of the wicks. I am inclined to think that lamps with wicks six-eighths of an inch broad will be mostly used, as the light emitted is a good one, and fit for all practical purposes; when properly trimmed, with a full supply of oil of an average quality, and the wick turned up as high as possible without smoking, these lamps will give a light equal to six and a-half sperm candles, with a flame one and five-eighths of an inch broad near the top, and as high as it is broad.

If, instead of placing the broad surface of the flame opposite the disk of the photometer, the narrow, or side surface, be turned towards it, the light emitted is found to be only equal to five candles instead of six and a-half.

I next examined the light of a smaller lamp with a wick a little over half an inch in breadth; the light given out under the same conditions, as in the former experiments, was equal to 4.8 sperm candles; this is a good useful light, and for the sake of strict economy, is preferable to the other,—it is, at all events, infinitely better than candles.

Let us now proceed to compare the light given by a petroleum lamp, with a wick six eighths of an inch broad, and that given by tallow candles, composites, sperm candles, and oil.

The results have been arranged in the form of the following table, on which I shall make a few remarks:—

	Petroleum.	Gas.	Tallow candles	Composite.	Sperm candles	Colza Oil.	Sperm Oil.
Light emitted ...	I.	1 to 1.3	10	6.3	6.5	0.61	0.55
Weight burnt in 3 hours 18 minutes	1,386 grains.	12.7 cubic ft.	408	5.50	4.80	2901	3.250
Price of material burnt in 3 hours 18 minutes	1d.	½d.	½d.	1d.	1½d.	2½d.	5d.

From six experiments, where the amount of petroleum burnt varied from 393 grains to 466 grains per hour, the average quantity of the oil consumed was 420 grains, the price of which, at 3s. 8d. a gallon, would be three-tenths of a penny, and consequently an amount of petroleum worth only one penny will burn for three hours and eighteen minutes; now two tallow candles, burning for three hours and eighteen minutes, will cost about one penny, and, as according to my experiments, petroleum gives about ten times as much light as a tallow candle, it will follow, that the expense of burning petroleum will be the same as that of burning two tallow candles, and there will be no less than five times as much light obtained from the oil as from the two candles.

In addition to the above advantage of petroleum over tallow, I may observe, that from the year 1860, the arrivals of tallow into London have diminished every year: the deliveries have also fallen off since 1861.

This scarcity of tallow in the market must necessarily enhance the importance of petroleum. I am indebted to a friend for the accompanying table, which shows very clearly the state of the tallow trade since the year 1859:—

Particulars of Tallow (in London).

Stock on the 1st June.

	Tons.
1859	12,081
1860	27,094
1861	65,555
1862	38,304
1863	37,812

Arrivals.—1st June to 31st May.

1859-60	94,625
1860-61	117,982
1861-62	100,122
1862-63	78,579
1863-64, to 13th February..................	799,87

Deliveries.—1st June to 31st May.

1859-60	79,612
1860-61	79,524
1861-62	118,573
1862-63	79,071
1863-64, to 13th February	54,968

Messrs. Rose, Graham, and Wilson, in their annual market report for the present year, inform us that the consumption of tallow has been much interfered with, through immense quantities of lard being imported from America, (which, but for the war, would have gone to the Slave States), and the substitution of petroleum in the place of common candles.

In comparing the expense of burning petroleum with that of consuming coal-gas, by measuring the amount of gas consumed, with a very accurate gas meter, it will be found that the quantity of gas burnt, by a good fish-tail burner, in three hours and 18 minutes is 12.7 cubic feet, which, at 4s. 6d. per thousand feet, will cost six-tenths of one penny, or, in round numbers, a trifle over one halfpenny.

With respect to the light given out, that of gas supplied as above is generally a little less powerful than that of petroleum, but for all practical purposes both lights may be considered equal; consequently gas in London, at 4s. 6d. per 1,000 cubic feet, is half the price of petroleum, but the oil presents many advantages over gas, which will make up, in a great measure, for the extra expense, as, for instance, the portability of a lamp, the pleasant subdued light of petroleum, instead of the dazzling brightness of gas, and also the fact shown by Dr. Frankland, that there is less heat given out by petroleum than by gas, and less products of combustion injurious to health. Then, in many small towns gas is very dear, and houses are but indifferently supplied with it; in other places, such as villages, country houses, there may be no gas at all, and in these cases rock-oil becomes an invaluable boon.

Where gas is very cheap, as in coal districts and manufacturing towns, it is probable that there will be but little petroleum consumed.

The following is a list of prices of gas for 1000 cubic feet in several towns in the United Kingdom. In those in which this commodity is dearest the oil will be most welcome, and *vice versa*:—

	s.	d.		s.	d.
Walton-on-Thames	7	0	Hereford	4	6
Sutton	7	0	Loughton	4	3
Berwick	6	8	Stoke-upon-Trent	4	3
Buckingham	6	6	Leicester	4	2
Weymouth	5	6	Hull	4	0
Aberdeen	5	5	Oxford	4	0
Gloucester	5	0	Sunderland	4	0
Limerick	5	0	Belfast	3	9
Birkenhead	5	0	Birmingham	3	9
Whitby	5	0	Wakefield	3	9
Stafford	5	0	Bristol	3	9
Scarborough	5	0	Lincoln	3	9
Peterborough	5	0	Durham	3	9
Dublin	4	9	Manchester	3	6
Balham	4	9	Leeds	3	6
Falmouth	4	9	York	3	6
Preston	4	9	Derby	3	5
Edinburgh	4	7	Liverpool	3	5
Glasgow	4	7	Carlisle	3	4
Rugby	4	7	Newcastle (Tyne)	3	4
London	4	6	Bradford	3	4
Chester	4	6	Nottingham	3	4
Cambridge	4	6	Cardiff	3	3
Cheltenham	4	6	Walsall	2	6
Worcester	4	6			

I have but a few remarks to offer on the expense of burning composites, sperm candles, sperm oil, and colza oil, compared with that of petroleum. One pennyworth of composites, while burning, will last as long as one pennyworth of petroleum, but the petroleum will give out 6·3 times as much light. As for sperm candles, the weight burnt in 3 hours 18 minutes will cost 1½d., or 1-3rd of a penny more than the petroleum, and the latter will give out 6·5 times as much light, consequently, there will be a considerable saving by using petroleum instead of sperm candles; the economy will be still greater if petroleum be consumed in the place of sperm oil, as the amount of this agent burnt by a very good moderator lamp, in 3 hours 18 minutes, will cost 5d. (at the rate of 10s. a gallon), or five times more than petroleum, but then the light emitted from sperm oil will equal that of twelve sperm candles; a moderator lamp, with sperm oil, will therefore burn as brightly as two petroleum lamps, with a wick 6-8ths of an inch in breadth.

There are petroleum lamps made provided with wicks over an inch broad, and giving a light nearly, if not as fine, as that of sperm oil, and the use of these will cost much less than 5d. for 3 hours 18 minutes.*

The objections to the use of petroleum are, its smell, the danger of the oil taking fire under certain circumstances, and being explosive where its vapours are mixed with air, and also its effects on the health of those engaged in the refining and wholesale trade of the substance. Petroleum, as extracted from the earth, certainly has a very unpleasant smell, but it is never used unless previously refined, when its odour is thereby greatly diminished. A petroleum lamp burning in a room does not, as far as my experience goes, give any smell, although a number of lamps, kept filled and ready for use in American cars and steam-boats, certainly do emit a slight but unpleasant odour. It is, however, principally when the lamp has just been put out, or whilst it is being trimmed, or filled afresh, that the smell is perceived; this odour is slightly unpleasant, but not unwholesome, except perhaps in the case of individuals engaged in the wholesale trade of the oil, as, for example, sailors on board ships laden with it, and workmen in refineries.

The danger of using petroleum from its being an inflammable, and, under certain circumstances an explosive substance, must not be exaggerated. It should be remembered that when coal-gas was first introduced most serious objections to its use were entertained from its explosive power, but this opposition has not prevented gas from being, at present, the most extensive means of obtaining artificial light.

Most deplorable accidents have certainly happened from the use of petroleum, and it is of the highest importance that everybody who employs this substance should do so with due care. If a lamp containing properly refined petroleum in a receiver made of earthenware or any other non-conducting substance, be allowed to burn undisturbed, I cannot think there is any fear of an explosion; indeed I am at a loss to understand by what means the oil can become sufficiently heated within the lamp to give out inflammable vapour. It is only with petroleum of bad quality that such accidents may occur; I mean when the oil gives out inflammable vapours below the temperature of 128° Fahr. To guard against this cause of accident I should advise people to test their petroleum before burning it. Mr. Young has recommended lately, in the *Times*, a method to effect this purpose, which is applicable to both coal-oil and petroleum. His plan has the advantage of affording the required information without the use of a thermometer.

The *Daily News* of the 21st inst. states, that at a meeting of the Association of the Medical Officers of Health, held on the 19th inst., Mr. Tegetmeier exhibited a very easy and practical mode of detecting dangerous oils. Two teacupfuls of boiling water and one of cold water were mixed together in a small basin; a cupful of the water was then taken, and a tea-spoonful of the oil to be tested poured on its surface; in a few seconds a light was applied to the oil. The dangerous oils, those capable of igniting below 120°, immediately took fire, whereas it was shown to be impossible to ignite those that were of a safe and non-explosive character.

By increasing the heat of the water, and testing the oil at every 10°, the temperature at which it will take fire is easily ascertained. It should be remembered, however, that the oil evaporates very quickly, so that a small quantity of the substance, say a tea-spoonful, should be added, now and then, to the portion left in the water; if the oil takes fire at a temperature below 128° it should be rejected.

The most frequent cause of accident is owing to the upsetting of a lamp, when the oil flowing out becomes kindled; great care should therefore be taken to place a petroleum lamp in some spot where it is not likely to be upset. I would, for instance, object most decidedly to the use of petroleum on board ships; the confined state of a cabin making any article therein, liable to be thrown down by an accidental back stroke of the hand, or some similar cause; but a still more serious objection applies to the pitching and rolling of the vessel at sea, which is likely to capsize any article that is not a fixture.

To avoid, as far as possible, accidents from the upsetting of lamps, where petroleum or hydro-carbons are burnt, I would suggest that lamp-makers should never turn out a lamp as fit for use unless the foot, or the part under the oil receiver, on which the lamp stands, be a good deal wider than it is generally made at present, and unless the weight of the lower part of the lamp be increased, by the addition of lead or some such metal. Many of the cheap glass lamps, used at present somewhat extensively, for burning such substances as petroleum, are more or less top heavy, and a trifling additional expense would make them much steadier and much safer. Supposing the case of a lamp upsetting and the oil taking fire, prompt measures will easily put out the flame, if the person on the spot does not lose his or her presence of mind; after placing the lamp upright, by throwing a cloth over the oil, or covering it with anything flat, to keep off contact with the air, the object will be speedily attained.

In order to obviate every risk of accident, as well as the smell, on board ships engaged in the petroleum trade,

* I have also examined the illuminating power of colza oil compared with that of petroleum; the light emitted is not quite twice as strong as that of petroleum, and its price is a little more than double that of petroleum. Colza oil is, in every respect, much cheaper than sperm oil.

a new plan has been adopted and carried out, on board the ship *Jane*, the property of the Liverpool and Ramsay Oil Refining and Chemical Works. The oil is stored in this ship in iron tanks, hermetically closed; the whole operation of transferring the oil from the vessel to the premises of the company has been effected without causing any nuisance whatever, as no smell of the oil could be perceived in the neighbourhood of either the vessel or the works.

My information as to the effects of petroleum on the health of those engaged in its wholesale trade is not sufficiently extensive and positive to allow me to enter into this part of the subject. I shall presently allude to the enormous quantity of sulphurous acid gas given out during the process of refining, which must affect more or less the lungs of those engaged in this business.

I have not attempted, on the present occasion, to establish the relative merits of refined petroleum and coal or paraffin oil, as more time should be devoted to this subject, to do it justice, than I could possibly command.

A Visit to the Petroleum Wells of Canada, in September, 1863.

The rock oil or petroleum wells which I visited in Canada, are situated near the southern extremity of Lake Huron, at a spot called Black Creek, in the district of Enniskillen. The town nearest the wells is that of Sarnia, built in a very picturesque bay of Lake Huron, and opposite Port Huron, in the state of Michigan. I stopped at Sarnia, with the express purpose of going over to Black Creek. A branch of the Great Western Railway of Canada connects the town of Sarnia with the village of Wyoming, sixteen miles distant, in a due east direction. From thence there is a high road proceeding nearly due south, by which Black Creek may be reached in a coach in two hours and a half, the distance being twelve miles. The state of this road, cut out through a dense forest, is still most primitive, and much difficulty is experienced in conveying in drays the barrels of oil to Wyoming. Suddenly a gap in the forest makes its appearance, the road turns to the left, skirting a pool of dark and stagnant water, and the adjacent village of Black Creek comes into sight.

The place has the appearance of being a rough clearing in a forest, crossed by a high road, on both sides of which are scattered a number of small wooden houses, containing a population of about 1,500 souls. In the intervening space between the houses and the wood, turf and stumps of trees may be seen; the Creek lies in a hollow, close to the village on its north side; its banks are now mostly barren of vegetable life, and here and there are felled trunks of trees, blackened as if by the action of fire, but on a closer inspection they are found to be covered by a black gummy coating of tar. The soil about these banks is black with the same material, and on the stagnant water of the pool floats a layer of a black oily substance, emitting a smell of naphtha, and on a bright day exhibiting a remarkable display of colours. Several rock-oil refineries have been erected on the banks of the Creek, into which they discharge the impurities of the crude oil.

The existence of liquid bitumen in the limestone of Western Canada was pointed out as long ago as 1844 by Mr. Murray,* and in the year 1850, or shortly after, this gentleman described a considerable deposit of solid bitumen, or mineral tar in Canada, extending over about half an acre; it was not, however, till 1857, that the distillation of this substance was undertaken, and I conclude that the account of the discovery of the petroleum springs which I heard related at Black Creek refers to that period.

This event occurred quite accidentally, as follows:— For some time previously a mass of semi-solid tar-like substance had been found in the forest, which on being refined yielded a small quantity of oil; it had been thought worth while to establish a refinery near this spot, and with the view of obtaining water for the steam-engine, a well was sunk, when suddenly, instead of water, a stream of petroleum burst forth. The second spring was discovered about a mile further off, on a farm, where I understood pigs had been burrowing. Some oil had oozed out of the ground, and a well being dug there, it yielded a full supply of this valuable substance. Since then no less than from 200 to 300 wells have been sunk upon an area of about two miles in length by one mile in breadth. At first oil flowed freely from these openings, but the supply gradually diminished and then ceased being yielded spontaneously, when it was found necessary to pump up the fluid. For about a year none of the wells have yielded spontaneously flowing oil. A number of wells have been recently abandoned, as not worth working, so that at present there are not more than about 100 wells from which petroleum is obtained. I walked into the forest, and presently came to a steam engine, placed under a shed, and used in boring a well. I was told that the depth then arrived at was 347 feet, and, so far, little or no oil had been found. When a well is about to be sunk, a convenient place is chosen, but there are no indications whatever to be adopted as a guide for the selection of the spot most likely to yield a good supply of petroleum. A shaft is first sunk through a layer of clay from 30 to 70 feet thick, then a layer of limestone rock is reached, and the boring effected by means of a steam drilling machine. The diameter of the pipe is about $3\frac{1}{2}$in.; several intelligent well-owners, whom I heard discussing the rate at which the boring operation is carried on, concurred in the opinion that from $1\frac{1}{2}$ to $2\frac{1}{2}$ feet was the depth attained every 24 hours. I was told, by a competent judge, that the sinking of a well costs about three dollars per foot, and that there is no certainty as to the result. The operation may be a complete failure, or prove a very lucrative one; but the probability of success is much less now than formerly. On one occasion it took nine months to drill through 550 feet of rock, at an enormous expense, and no oil was found. The deepest well which is now being worked attains a depth of 250 feet in the rock. Most of them are from 150 to 200 feet in the rock. The pumps used to raise the oil out of the wells are generally worked by steam-power; but sometimes the operation is carried on by means of horses, and occasionally by hand. The object of pumping, besides that of raising the oil, is to remove the water which continually accumulates in the well. Where a steam engine is continually kept at work, oil and water are raised together; but if the operation be discontinued for any length of time, it will be found necessary to pump out water alone, before any oil can be extracted.

In my ramble through the forest I saw two men engaged in pumping a well by hand; they told me that after pumping up water for a whole day, about a barrel of oil (or 40 gallons) rose to the surface during the night, this they ladled out the following morning, and then proceeded again to pump out the water. The men informed me of a very ingenious method which they adopted for measuring the thickness of the layer of oil in the well; for this purpose they let down into the oil an empty bottle, fastened to a string with the opening turned upwards. The depth to which it was necessary to lower the bottle in order to fill it with water indicated the thickness of the oil stratum. It will be understood that when the bottle was immersed into the petroleum it became filled with this substance, but as soon as it reached a spot below the oil, the water of the well, on account of its greater weight, displacing the oil from the bottle filled it at once. I visited several wells where oil and water were pumped out together, by means of steam power; a black stream issued from the spout, the depth of colour of the fluid continually changing according to the proportion of the oil present; the liquid was received into a large wooden tank, first falling on a splashing board,

Philadelphia Coal Oil Circular, 2nd Sept., 1862.

which afforded better means of judging of the colour of the stream, and thereby ascertaining roughly the quality of the oil; only 1 per cent. of oil gave the stream a very dark colour. I myself collected a specimen of the fluid in a bottle by placing it under a pump spout while water and oil were being raised out of the well. The tank was generally about 10 feet diameter by 7 feet deep; its upper part was occupied by a layer of crude oil, which, being much lighter than water, had quickly risen to the surface. This crude oil presented an intensely black colour and a thickish consistency. I was informed that when it has reached a certain height in the reservoir it is let out by a side pipe, by which it passes into a smaller cask, which contains nothing but the oil; by opening a tap at the lower part of the tank the water is allowed to escape. This simple method effectually separates, without trouble, the petroleum from the water with which it was originally mixed. The crude material is let out from the smaller cask into barrels, each containing 40 gallons. The pump I have sketched raised the oil from a well 246 feet deep from the surface, 196 feet of which are in the rock. I observed two wells close to each other, and pumped out by one steam-engine; they were both sunk to a depth of 225 feet through the rock, and 270 feet from the surface. I was given to understand that the pump-shafts opened at about 30 feet from the bottom of the wells, but there is no rule as to the distance intervening between the end of the pump pipe and the bottom of the well; this varies in different wells from ten to thirty feet. My attention was directed to the escape of gas occurring at the mouths of the pipes through which the oil was pumped out of the two wells I was observing. This gas imparted to light a peculiar oscillation, which revealed its presence. No positive information can be obtained as to the distribution of the oil in the bowels of the earth; it is invariably found, at Black Creek, in limestone rock; and we may surmise that in order to yield oil a well must strike one or more fissures through which this fluid is slowly flowing. The petroleum appears to be washed out of the fissures by water, but I am not aware of any evidence showing that water does not enter the well through other channels. The pressure exerted on the openings into the oil-bearing fissures by the column of water which accumulates in the well is a great obstacle to the flow of oil; and on this account it is important to keep the pumping-engines at work day and night. If the operation be discontinued, even for a few hours, it will be necessary to pump up water for a still longer time before any oil can be obtained.

I have previously stated that when the springs were first discovered a large quantity of rock-oil was discharged spontaneously. This phenomenon appeared due to the pressure exerted by a certain quantity of gas confined in a cavity between the surface of the fluid and the rock, the oil being thereby pressed out with much force through the fissures existing in the rocky reservoir; from the remarkable circumstance that the wells all ceased flowing spontaneously at about the same period, it does not appear improbable that the various springs issued from one original mass of the substance in question; the oil ceased flowing apparently because the gaseous pressure in the oil-trough became relieved from the gas escaping through the wells.

There is much uncertainty as to the origin of petroleum. Professor Lesley* observes, "that oil is not found in immediate contact with coal beds made of land or fresh water-plants; but, on the other hand, coal oil regions are geographically connected with coal bed regions whether of Devonian, carboniferous, oolitic or tertiary age." Another statement of Professor Lesley appears to show that petroleum may also have an animal origin, for he observes, "The coniferous limestone next above the Niagara has the cells of its fossil corals filled with petroleum, the remains of the gelatinous coral animals which inhabited them."

* "*Coal Oil*," by T. P. Lesley, Professor of Mining, University of Pennsylvania.

The crude oil is conveyed at once to the refineries, many of these establishments being close to the wells at Black Creek. The object of the operation of refining is to separate the oil from the tar, and to remove from it certain volatile constituents, among which is a compound, very combustible and explosive at comparatively low temperatures. This oil is also discoloured, and in a great measure deodorized before leaving the refinery. The usual mode of proceeding is to commence by submitting the crude oil to distillation; the first portion of the fluid which distils over contains the dangerous compound and is set aside; the residue is pumped up into a large vat, where by means of steam-power it is briskly stirred with sulphuric-acid and water. During this operation a large quantity of sulphurous acid is formed, and the fluid assumes a white milky appearance. The amount of sulphurous acid evolved is so great that none but men accustomed to the work can remain in the room where the operation is being carried on. This I had an opportunity of ascertaining to my own discomfort; and I feel assured that this part of the business of refining rock-oil must be very unhealthy. After a certain time the stirring is discontinued, when the liquid divides into two layers, a lower layer, exhibiting the appearance of a white emulsion, and a higher one, consisting of pure oil. The lower portion is now drawn off by opening a tap at the bottom of the vat; more water is added to the oil from above, and the stirring rod is again set in motion; this operation is repeated several times, until the whole of the sulphuric acid and impurities have been washed out of the petroleum. It is now nearly colourless, and its smell becomes much less perceptible. I witnessed the various processes carried on in petroleum refineries at Black Creek, but never saw any kind of alkali used. I believe, however, the final treatment with some alkali is frequently if not always adopted.

Before barrelling, the oil is usually tested, to make sure that the temperature at which it takes fire is sufficiently high. Mr. Price (who I believe was formerly chemist to the now dissolved Oil Well Company of Canada) kindly supplied me with much interesting information on the refining of crude petroleum, and presented me with a specimen of refined oil, which, he told me, could be heated to 180° without taking fire. I sincerely regret having just heard that this able and obliging chemist died at Black Creek in November last.

The supply of rock-oil in Canada has considerably decreased of late. While at one time one spring yielded no less than about 2,000 barrels in 24 hours, in September last the whole quantity of petroleum extracted weekly from the Black Creek wells did not exceed from 700 to 800 barrels.

I have attempted, gentlemen, in this communication, to show you the present condition and prospects of the petroleum trade. I have directed your attention to the economic value of rock-oil; and my description of the Canadian wells may have given you an idea of the aspect and mode of working of all other petroleum wells. I must apologise for bringing forward so little new matter, but I am glad to have had this opportunity of introducing to your notice so valuable a substance as petroleum.

DISCUSSION.

The Chairman said the meeting must have been deeply interested by Dr. Marcet's very lucid account of the method of obtaining these valuable oils, as well as by the results of his experiments respecting their value for illuminating purposes. There were several other applications of these oils which, no doubt, Dr. Marcet's time had not enabled him to enter into. It was a matter of great wonder that such exceedingly useful materials as these should have remained unnoticed for so long a period of time, for they already represented a considerable amount of wealth; and, if continued supplies were ob-

tained, would form an important article of commerce, especially when they considered the great falling off which had of late taken place in the supplies to this country of animal fats, from the whale fisheries and other sources. It was not uninteresting to notice that in this, as in other cases, men only found what they sought for, for although these oil-springs were known to exist, they were only turned to account when a necessity arose for discovering new sources of supply of materials for illumination. Oils of this character had been manufactured by Mr. Young and others in great quantities before the notice of the public was attracted to these oil springs; and being thus made aware of the immense value of these products, men came to direct their attention to their importation into this country. It was to be lamented that the supply of this oil was so intermittent, which would seem to point to the artificial preparation of paraffin oils as a more permanent source of supply. He would now invite discussion on Dr. Marcet's paper.

Mr. Tegetmeier remarked that with regard to the use of these oils for lighting purposes, he was happy to see that the standard of safety was placed by Dr. Marcet as high as 128°. In the discussion which had recently taken place on the subject in the newspapers it had been asserted that this might with safety be brought down as low as 100°, but he regarded that as a mistake. He had with him a sample of oil that had caused a dangerous accident at Bethnal-green, when an explosion of the oil took place inside a lamp merely owing to a person attempting to extinguish it by blowing it out. The point of temporary ignition of that oil was 112°, and of permanent ignition 114°, and notwithstanding that fact, persons were not wanting who asserted that 100° was a sufficient standard of safety. He had also brought with him a sample of the oil which had caused the loss of three lives in Yorkshire, and the inflaming point of that oil was as nearly as possible 100°. If, however, oils of a sufficiently high standard were employed, the danger was inconsiderable, for in the report by Capt. Shaw, for 1862, upon the fires in the metropolis, 124 fires were attributed to gas, and only two to mineral oils of all descriptions—petroleum and paraffin. Samples of these oils were, however, frequently met with which would inflame at a point below 32°, the freezing point of water. Some might say these were not oils, but spirits; they were, however, unquestionably hydro-carbons, and were used for burning. For instance, he held in his hand a specimen of the oil used to light the *Warrior*, and this would ignite at ordinary temperatures, and if a light were even brought near to it, it would inflame without actual contact. [This was shown by experiment.] He thought it a matter of grave importance that millions of national property and thousands of valuable lives should be thus imperilled. The mode in which it was used on board this ship was this:—Atmospheric air was driven through reservoirs of it, and the vapour thus produced was distributed through pipes, and burnt with ordinary burners, like gas, the absurd title of ozone-gas being given to it. It was, he said, impossible to overrate the danger of that commodity; gunpowder was safe in comparison with it, because a light must be placed in contact with gunpowder to cause it to explode, whereas this vapour was so subtle that it would, in fact, run to the flame. He thought it was impossible to overrate the extreme danger of such a method of lighting on board ships, and the importance of the subject was his apology for having brought it before the meeting.

Dr. Bachhoffner said the views of the gentleman who had just addressed the meeting appeared to be opposed to those enunciated by Dr. Marcet, inasmuch as it was urged in the paper that petroleum oils could, with ordinary care, be used with perfect safety. The vapour used on board the *Warrior* in the manner described, was neither more nor less than Mansfield's patent, who unfortunately lost his life in experimenting on these substances. His method of driving atmospheric air through a highly volatile hydro-carbon, was a very different thing from burning that liquid in ordinary lamps; and it was used under very different conditions to being stored aboard the ship in bottles or other receptacles. At the same time he was not prepared to say it was a wise thing to carry so dangerous a commodity as this had been shown to be on board of one of Her Majesty's ships. Upon the subject of petroleum generally, he would remark it was merely another form of the well-known camphine. But Dr. Marcet had stated two or three facts which somewhat astonished him; one was—that petroleum was less deleterious in combustion than any known combustible compound used for lighting—also, that it gave off less heat. He hardly knew by what standard those two qualities were to be judged. They knew that the illuminating power of any substance depended upon the amount of carbon consumed in the flame, and therefore it struck him as singular that the petroleum oils, which were so rich in carbon, should have less heating powers than other oils. There was one point with regard to the use of rock-oil to which allusion had not been made—that was its employment, underc ertain conditions, as a substitute for vegetable turpentine. He believed that substitution was carried on to a considerable extent, but he also believed that practical painters and builders always found that paint prepared with it was subject to tackiness and never presented the dry surface which was obtained by the use of the ordinary vegetable turpentine. Dr. Marcet had stated that there was less danger in the use of petroleum than coal-gas. The latter was certainly a very explosive commodity, but with the exercise of due precaution he did not see much difference between the one and the other, and he apprehended the large number of casualties arising from gas were attributable to the fact of its being so extensively used, whilst lighting by petroleum was very exceptional. He believed the majority of accidents with petroleum oils arose from the careless practice of trimming the lamps while burning. The test of these oils had been described as a very simple one, only requiring two cups of water, hot and cold; but while admitting the simplicity of this, he questioned whether one person in a thousand would take the trouble to apply that test each time he got in a stock of oil; and until the sale of this article was so regulated that the persons who used it were perfectly safe from danger, he thought it was not to be recommended for general use in private houses.

Mr. Madden took exception to the statement of Dr. Marcet in attributing the invention of the lamp used for burning these oils to Mr. Young. It was, he said, originally the invention of Wagenmann, a German. At the expiration of the three years' protection of the patent it was not renewed, and it was then that Mr. Young took it up and introduced it extensively. The average lighting point of this oil would not be higher than 114° or 115°, and in some cases 125°: at 180° he thought the illuminating power would be very small indeed. He had used petroleum since its introduction, from having seen it employed in Germany, where it was first introduced. He believed with ordinary care it might be used with as much immunity from danger as colza or any other oil.

Mr. B. H. Paul, having expressed his thanks to Dr. Marcet for his able *resumé* of the known facts with regard to the sources of petroleum, and the purposes to which it had been applied, remarked that no mention had been made of one of the most important instances of the introduction of petroleum into this country—viz., the petroleum of Rangoon, a preparation from which was first used under the name of Belmontine, which was perhaps the best material ever produced for illumination, when its safety and freedom from pernicious properties in combustion were considered. Having himself taken some part in the newspaper discussion referred to by Mr. Tegetmeier, he would say a few words in reply to what had been stated by that gentleman this evening. It was always desirable in the case of a new material like petroleum, where the opinions of scientific men could be of use in guiding the public, that such opinions should be fairly and freely expressed: and that where warning was necessary it

should be as freely given: but at the same time the position of scientific men ought not to be taken advantage of to excite a fear in the public mind for which there was no foundation. For some reason, which he was at a loss to understand, it had been put forward, and to a great extent recognised—more, he believed, from ignorance of the real facts than any thing else—that the characteristic of safety of these materials was that they should not burn at a temperature below 130°. He had no hesitation in saying that was an indication which had no kind of value whatever; and as a proof of that he would state he had been in the habit of burning in his house—not oil—but a spirit made from petroleum, which would ignite at the freezing point of water. He had burnt that spirit in a lamp, in a room the temperature of which was from 65° to 70°, and he burnt the lamp the whole evening without any tendency to accident.

Dr. Bachhoffner inquired what was the boiling point of that liquid.

Mr. Paul replied 70° Fahr., and the igniting point was 32° Fahr. It was an extremely volatile spirit prepared from petroleum. Having enumerated some of the accidents which had occurred in the use of paraffin and other oils, he remarked that the conclusion he had arrived at was, that the danger did not consist in the material itself, but in the folly of those who used it. With reference to the strong point which had been raised by Mr. Tegetmeier as to the employment of so extremely volatile a material for lighting the *Warrior*, he would remark that the extreme volatility of the material was the greatest security against risk in its use, and against the possibility of its explosion.

Mr. E. V. Gardner said he should be glad to know whether, in the instances of accidents alluded to, the lamps were made of metal or not? because he had found from experiments that petroleum could not be used in metallic lamps without risk. From the conductivity of the metal the lamp became so hot that gas was generated, and there was danger of explosion; but he had never heard of any accident occurring where due caution was used, and where the lamp was made of a non-conducting material. He had experimented very largely with these light oils or spirits; he saw no objection to their being called spirits. Spirits of wine and ether were not so very far removed from this species of petroleum, but they differed in one important characteristic, viz., that it was almost impossible to get an explosion by mixing the vapour of petroleum with atmospheric air, whilst with ether or spirits of wine this could easily be done. The fact of its being possible to burn the vapour of these oils mixed with atmospheric air, using the burner employed by Mansfield, which had nothing about it approaching the safety principle of the Davy lamp, was evidence of non-liability to explosion. Camphine lamps had been in use for a long time, but they did not hear much about the danger of them, and camphine in itself was very much more dangerous than petroleum, and its igniting point was lower than that of most paraffins. He believed most of the accidents that had occurred were in a great measure owing to the want of care and presence of mind of those concerned. He did not believe there was more risk with these light oils than with any other mode of illumination ordinarily employed. Another fact had not been noticed. Some of these paraffin compounds had a peculiar way of creeping, by capillary attraction, out of the lamp and down the sides of it, and drops of oil were found trickling on the outside of the lamp. That oil might become ignited, and, if not soon extinguished, it would so heat the lamp as to cause explosion. He was quite certain paraffin could be prepared without the slightest smell, and without danger as to its igniting point; at the same time, if these oils were improperly distilled, they always contained within them an element of danger.

Mr. G. F. Wilson, F.R.S., said, as Mr. Young had been denuded of the honour of the invention of the paraffin lamp, it would not be fair to deprive that gentleman of the credit to which he was entitled of having been the first to introduce mineral oils for lighting purposes. Mr. Paul had alluded to the Belmontine oil, which was the result of Mr. Warren De la Rue's chemical investigation of the Rangoon petroleum; though those experiments had been known for a long time, the oil which was the practical result, was not introduced into commerce till after Mr. Young's paraffin oil had been brought out. With regard to the point brought forward this evening by Mr. Tegetmeier, as to the dangerous character of the material used for lighting the *Warrior*, he (Mr. Wilson) was well acquainted with that very volatile liquid; and, at first sight, it would appear to be a somewhat dangerous element to carry on board ship. It had, however, been stated that the liquid was so secured that it could not come into contact with flame; at the same time, it might occur to many present that a valuable Government ship was hardly the proper place in which to try delicate lighting experiments, which, to say the least, this appeared to be. With regard to what Dr. Marcet had stated, as to the economic value of petroleum, and the statement of the Chairman—that this mineral had come in the place of the partial failure of other means of lighting—he (Mr. Wilson) thought that hardly did justice to the importance of the subject, for it was not only in sperm and other mineral oils, but also in vegetable oils that the supplies were not nearly keeping pace with the existing demand for such materials. As people became more civilised they washed themselves more, and the demand for soap was greater; as the people became more educated they read more, and there was a greater demand for artificial light; and it was evident that, if the diminution of the supplies of these substances, animal and vegetable, had continued to the same extent as at present without these valuable mineral sources being made available, we should have had to pay very dearly for our lighting materials.

Mr. Philip Palmer mentioned that a friend of his sustained the loss of a very valuable portfolio of engravings through their being set on fire by the upsetting of a lamp upon them through the mere slamming of a door. He thought accidents from these lamps might in a great measure be obviated by there being a larger base for the lamp to stand upon, and also by weighting it to a considerable extent, so as to increase the steadiness.

Dr. Marcet, in reply upon the discussion, said with regard to Mr. Young having been the inventor of the lamp, he stated he believed that was the case, but if he was in error on that point he was happy to stand corrected. With regard to the Rangoon oil, he fully admitted its importance —the more so from the very able investigations of Mr. De la Rue and other gentlemen. With respect to the lamps being constructed of non-conducting materials, he attached the highest importance to this. Lamps of metal were certainly more or less dangerous, and he could easily understand that the oil, volatilised by the heat of the metal, would be liable to take fire and explode. With regard to the less degree of danger with petroleum than with coal gas, remarked upon by Dr. Bachhoffner, all he said was that on the first public introduction of coal gas it was received with great alarm, and a strong opposition was raised up against it, but that opposition was overcome, and gas was now the most extensively used method of lighting. With regard to petroleum giving out less deleterious matter than other lighting agents, he made that assertion upon the authority of Dr. Frankland, who was known to be a most careful and trustworthy experimenter, but he (Dr. Marcet) had not made any personal investigation into the matter.

The Chairman said he would now propose, what he was sure would be very acceptable to the meeting—viz., a vote of thanks to Dr. Marcet for his admirable paper on this subject. One point he begged to submit to the consideration of the meeting in relation to the question of danger—It seemed to him that the properties of a substance, irrespective of the manner in which it was used,

really did not enable them to judge whether it was dangerous or not. The only way in which we could form an opinion of the danger of any operation would be by knowing, not only the materials used, but also the exact way in which they were used. It would be readily assumed that, on board a ship like the *Warrior*, there was more perfect discipline and system in everything than in ordinary households, and, therefore, if any place were safe for the introduction of such a system of lighting as had been alluded to, this was so. Probably the generator was stowed in some out-of-the-way part of the ship—it might be far below the water line—and the vapour was conducted by pipes to the parts of the vessel where it was burnt; under such conditions the element of danger might be reduced to its smallest possible limit, and the use of that volatile substance under such circumstances was far more safe than in the hands of careless servants or other persons in ordinary households. He knew personally nothing of the particulars of the lighting of the *Warrior*, but he thought the meeting would agree that to consider the nature of the substance alone, without knowing the manner in which it was used, was not sufficient to form a correct opinion on the subject.

A vote of thanks to Dr. Marcet was then passed.

Proceedings of Institutions.

Bromsgrove Literary and Mechanics' Institution.—The report for the year 1863 speaks of satisfactory progress. The adult evening classes have been successfully carried on, and to the superintendent, the Rev. R. Mumford, and the voluntary teachers who have so kindly aided him in his zealous endeavours, the committee have to express their thanks. These classes meet twice a week. The working men's cricket club has also been carried on with success. The school of art in connection with the Institution, has continued in a satisfactory state, and now numbers about sixty pupils. The French class has not been so well attended as could be desired. The class for instruction in vocal and instrumental music is at present in abeyance. The committee regret the loss of the services of Mr. Marcus, as honorary secretary, as he has ever been most active in furthering the objects of the Institution. The number of members is now 335, being a rather smaller number than last year; of these 114 are working men. The issues of books and magazines during the year have been 6,300, instead of 4,400 the previous year. The funds of the Institution are in a satisfactory state; the receipts were £204 18s.; the balance against the Institute is £9 10s. At the recent examinations in connection with the Worcestershire Union, various members obtained prizes. The annual soirée was held in the Corn Exchange, on the 8th of February, under the presidency of Viscount Ingestre, M.P. On the platform were the Earl of Shrewsbury and Talbot, Lord Lyttelton, the Hon. and Rev. J. W. Leigh, the Hon. and Rev. H. Douglas, H. F. Vernon, Esq., M.P. (the president of the Institution), Rev. G. W. Murray, and others, many of whom addressed the meeting, which was largely attended.

Ebbw Vale Literary and Scientific Institution.—Prizes are offered for essays on the following subjects:—English.—1st. The advantages to be derived by working men from their connection with well-constituted benefit clubs. 2nd. Self-dependence. Welsh.—1st. Y manteision deilliedig i'r dosbeirth gweithiol oddiwrth gymdeithasau darbodus o gyfansaddiad da. 2nd. Hunanymddibyniaeth. First prize for each subject, £3; second ditto, £1 10s. The adjudicators are—English, the Rev. Evan Lewis, M.A., Aberdare; Welsh, the Rev. Dr. James, Santeg. The conditions of competition are:—All compositions to be those of persons who maintain themselves by manual labour, and who have been members of the Institution during 1863 and 1864. The length of the essays not to exceed 500 lines of foolscap paper, and to be written in a legible hand on one side of the paper only: each paper to be distinguished by a motto, and the real name of the author to be written on a blank leaf, folded and sealed. All quotations to be distinguished by inverted commas. If the committee so decide, the successful compositions to be read at the annual soirée, or on some other convenient occasion. All compositions to be sent to the honorary secretary on or before the 3rd March, 1864.

Farnham Young Men's Association.—On the 1st of February a lecture was delivered, "On the Sources of the Nile," by Rev. T. D. Wickham, M.A., of Holmwood, Dorking. The lecture was illustrated with diagrams. The Bishop of Winchester occupied the chair.

Fine Arts.

SCHOOLS OF ART AND INDUSTRY IN FRANCE.

In the *Journal* for the 25th of December last was published the decree containing the regulations relating to the recent re-organisation of the Schools of Art in France, and it may now be interesting to trace the origin of this important movement. It appears that in July last M. Rouher, the Minister of Agriculture, Commerce, and Public Works, addressed a letter to the Emperor, in which he submits for His Majesty's consideration the subjoined facts and propositions:—

"The results of the International Exhibition of 1862 proved that, if new and rapid progress was not made in art education, France would be surpassed by her rivals. This fact, the French section of the International Jury considered of sufficient importance to draw the particular attention of your Majesty to it, by which means it is intended to develop artistic and professional education in this country. The time has now arrived when measures should be taken, and a special commission of inquiry should be named.

"France is not entirely without professional studios and schools of art, but their systems are so at variance with each other, that they do not afford any means of giving gradual and methodical instruction. For instance: The Central School of Arts and Manufactures offers instruction applicable to all; the Imperial schools of mining, of bridges, and construction, however, are only open to free students, who apply themselves simply to mining and construction. In taking count of the number of students who go out each year from these establishments into active service, it is found that they bear but a small proportion to those in the same profession not so educated; nevertheless, in reality this number would suffice for all wants, and at first sight it would not be deemed necessary to increase the number of these schools; but though the subjects taught in these establishments are useful auxiliaries to industrial work, they are not numerous enough, and a demand should be made for the establishment of other schools for instruction in other subjects. It is necessary, then, in establishing these schools, to consider how they should be organised, and the commission will therefore have to make a programme of proposed rules, &c., for their administration.

"One of the chief points to be considered is instruction in drawing as applied to industry.

"A committee, formed from the French section of the International Jury, laid great stress upon the subject of industrial education; and M. Merimée has, with the unanimous consent of the committee, called the serious attention of the French Government to the necessity of proper measures being taken to protect the interests of the country. 'Since the Exhibitions of 1851 and 1855,' their report says, 'immense progress has been made throughout Europe; and although it cannot be said that we have remained stationary, yet we cannot deny the fact

that the advance we have made is not so great as that made by other nations. Reviewing the recent successes obtained by our manufacturers, we ought still to remember that defeat is possible, and that the only way to guard against it is to preserve our superiority and persevere in bringing our works to the utmost perfection.' The committee say further, that the instruction, such as it is, in the school at Paris, and in the secondary schools in the rest of the empire, is not such as to supply the want felt by the middle and working classes. These are the principal points into which the commission would have to inquire."

M. Rouher then proceeds to nominate the Commission, which includes M. Michel Chevalier, Senator; M. Le Play, Counsellor of the State; General Morin, Director of the Conservatoire des Arts et Metiers; M. Tresca, Under-Director of the Conservatoire des Arts et Metiers; M. Piedmont, Director of the Imperial Central School of Arts and Manufactures; M. Arlès-Dufour, Member of the Chamber of Commerce at Lyons; and other distinguished names.

The late Eugene Delacroix.—An interesting sale is now going on in Paris consisting of a large number of original pictures, replicas, cartoons, nearly 6,000 sketches of various kinds, lithographs on the stone, etchings on steel and copper, and miscellaneous productions of the late Eugène Delacroix, together with a small collection of the works of other artists in the possession of the deceased, and the utensils and materials from his atelier. The catalogue contains no less than 858 lots, being divided into three series. The first of these includes a large collection of the sketches and cartoons of the numerous and remarkable decorative works of art executed by Delacroix in Paris and other places. Conspicuous amongst these are the works in the Chamber of Deputies, the Palais de Luxembourg, the ceiling of the Galérie d'Apollon in the Louvre, that of the Hotel de Ville, and the mural paintings in the churches of Saint Sulpice and Saint Denis du Saint-Sacrement, most of which are well known to all lovers of art. Next come nearly fifty original paintings, with a few finished sketches of his larger works, including the Battle of Nancy; the Battle of Faillebourg, won by Saint-Louis, now at Versailles; and a variation of his famous work, the Assassination of the Bishop of Liège by the Wild Boar of Ardennes. The original pictures, properly so called, include "La Sibylle" and other works, exhibited in 1845, and again in 1855, at the great Paris exhibition. After these come no less than thirty-two unfinished works, the subjects being principally sacred or mythological. The next division of this first part consists of twenty smaller sketches, like all the preceding, in oil; many of these have never been executed as finished pictures, and of those which have been so carried out, the sketch, or rather variation, of his well known Médée furieuse, in the Lille museum, and that of the Chasse aux Lions, at Bordeaux, are the most remarkable. Following these are from twenty to thirty copies and studies, by Delacroix, from the great masters, Raphael, Paul Veronese, Giorgione, Rubens, and others. Some of these, especially the last named, are charming works. The next division contains a large number of delightful studies from nature, many of them of considerable dimensions, and exhibiting the beauties, and in some cases the defects, of the artist in a remarkable manner. The first part of the catalogue concludes with a number of paintings by other artists, those of his friend Géricault being the most numerous, and consisting principally of copies from the old masters. There is a forest scene by Diaz; a young Greek, by Louis Boulanger; a bust by Jordaens; and a copy, by Planet, of Eugène Delacroix's own picture of the Jewish Wedding, now at the Luxembourg. The second part of the sale consists of water colour and other drawings, and sketches of all kinds, and presents almost more attraction to the connoisseur than the former. This portion of the collection may be described as presenting almost a complete history of Delacroix's artist life, of his various styles, and of his aspirations as well as of his attainments. It includes a large number of decorative works, the sketches, in fact, of almost every important one that he ever executed, together with many never carried into execution; sketches for his Dante, Shakespeare, Goethe, and Byron pictures; his delightful studies in Spain, Algeria, Morocco, Arabia, Turkey; seventeen water-colour drawings, and twenty-two sketches taken in England in the year 1826, principally from the banks of the Thames, and on the sea coast; landscapes, fruit and flowers; and a large collection of studies of animals, especially lions and tigers, for which he seemed to take a special liking, and which he drew with an amount of animation and savage grace and beauty that has certainly never been surpassed. Lastly, in this series are no less than fifty-seven albums and pocket-books crammed with sketches and notes, in colours, sepia, pencil, and pen and ink, from his early youth down to the last years of his life. The third portion of the sale consists of engravings and lithographs, the most remarkable being the series of thirteen stones with subjects from "Hamlet," executed by Delacroix between 1834 and 1843; three others also from "Hamlet," unpublished; and four from "Gœtz de Berlinchingen." The pictures and sketches are fetching enormous prices. The following are a few of the most noticeable items:—The original design for the grand ceiling of the Galerie d'Apollon in the Louvre was withdrawn by the representatives of the deceased, and a replica fetched no less than £206, while the first draft of the same, in oil, but measuring only about 2 feet by 18 inches, produced £40. The original sketch of the ceiling at the Hotel de Ville fetched rather more than £50. The sketch for the picture of King Jean at the Battle of Poitiers, produced £188; that of the Battle of Nancy, £180; of the Battle of Taillebourg, the large work at Versailles, £300; the Sybille, exhibited in 1845 and at the Paris Universal Exhibition of 1855, £134; the Wounded Cuirassier on the field of battle rising between two dead horses, a very small but most remarkable picture, £124. Four large pictures of flowers, which attracted great attention in Paris in 1849 and 1855, fetched together £1,020. A copy by Delacroix of the portrait of the Youth in black by Raphael, in the Louvre, fetched £130; one of the Belle Jardinière, £200; and one of the Miracles of Saint Benoît, of Rubens, £260. Two days' sale, 249 lots, realized between £7,000 and £8,000.

National Gallery of Ireland.—This gallery, which was formally opened to the public on January 30th, is built on the lawn of the Royal Dublin Society in Dublin, and forms a pendant to the New Natural History Museum. It has been constructed on the principle of top lighting, so successfully realized in the gallery built for the Sheepshanks collection. This principle is equally applicable to private as to public galleries, to large as to small rooms. It requires that the width and the height of the room should be the same, and the space for the skylight half the width. Thus, if the width of the floor be twenty feet the height should be twenty feet, and the skylight ten feet in the centre. A picture properly hung in such a room cannot have any glitter and must be perfectly seen. Mr. Sheepshanks very nearly arrived at settling this principle in his own private gallery at Rutland Gate, from which he himself assisted to cart his pictures to the South Kensington Museum. But it was Mr. Redgrave, R.A., who reduced the principle to the simple formula, and Capt. Fowke, R.E., who successfully carried it into practice at the South Kensington Museum, at the Exhibition of 1862, and now in the National Gallery of Ireland.

The Hotel Cluny.—A new room has just been opened in the museum of the Hotel de Cluny, in Paris, which is devoted to French *faience*, the production of the old potteries of Nevers, Rouen, Marseilles, and Strasbourg,

and which contains already more than six hundred specimens of various kinds. The most striking objects are:—A magnificent Rouen chimney piece, ornamented with blue designs on a white ground; a small circular table or guéridon, of the same ware, in one single piece, richly ornamented in the style of Louis XIV., with medallions and arabesques; a large inkstand, with Chinese ornaments, an early attempt to imitate the porcelain of Asia; and a stove in form of an ancient altar, of Nevers make, ornamented with rams' heads, and otherwise decorated. The cases are filled with a numerous collection of objects; enormous tureens, flower vases of most eccentric forms, fancy ornaments in the form of children, fruit, a cobbler at work in his stall, a small sedan chair bearing the arms of the Dauphin, and many more. Against the wall are a number of fontaines, or small tanks, of various forms, some of them very elegant, and a clock of Strasbourg ware, of the time of Louis XV. In another part of the room is a stand, on which is a curious collection of specimens; plates with fruit, asparagus, and other objects in relief, tureens, and other articles in the form of turkeys, fowls, pheasants, and other birds, in some instances exhibiting brilliant colours. Two plates of Rouen ware are decorated with sonnets, music as well as words. This new room adjoins that which is called the Galérie des Couronnes, on account of the nine golden crowns contained therein. These nine crowns were found, in 1858, by a French officer, at Fuente-de-Guerrazar, near Toledo, and are said to have belonged to the Princes of the Goths, and to have been buried probably in the commencement of the eighth century, or about the time of the invasion of the Peninsula by the Arabs. They are massive objects, and in excellent preservation. As to the ornamental earthenware above referred to, there is a perfect furore for it in Paris at the present moment; a soup tureen aud stand of Rouen ware fetched 4,000 francs the other day, and a plate of the same fabric 1,200 francs. But the most remarkable instance was that of a candelabrum, forming part of the celebrated service of "Henri II.," from the collection of Madame de Sayette. This curious piece is of a monumental form, is richly decorated with arabesques in enamel, figures supporting the arms of Henri, human masks, heads of cherubim and lions, and garlands of flowers, and fetched the enormous price of 13,500 francs. There are seven pieces of this service in the museum of the Louvre and that of the Hotel Cluny. Baron Rothschild and M. de Pourtales each possess one sample. It will be remembered that about twenty pieces, all the rest known, were exhibited at the Kensington Museum in 1862. At the same sale an enamel cup, bearing the monogram of Leonard Limousin, and ornamented with the arms of Léon and Castile, fetched 10,650 francs.

Copyright.—On the 3rd instant Mr. Black obtained leave to introduce a bill for the consideration of the acts relating to copyrights in works of literature and the fine arts, and the bill was brought in and read a first time.

Manufactures.

Steam Boiler Explosions.—The ninth annual report of the Manchester Association states that at the close of the year 1863, there were under inspection, at 552 factories and other works, 1,458 boilers and 1,090 engines. The gross indicated horse-power of all the boilers under inspection may be stated approximately to be 131,014. The defects discovered in boilers are mainly of two distinct classes—one relating to their construction, and the other to their condition. Under the first head, that of construction, numerous recommendations have been made; in many boilers the internal tubes have been recommended to be strengthened by hooping; in others it has been suggested that the shells be strengthened at the steam dome, by stays of angle iron, &c.; in others, that the shell be strengthened at the ends; in others the load on the safety-valves has been recommended to be reduced. The defects appertaining to the second head, viz., that of condition, were fracture of plates and angle irons, blistered plates, furnaces out of shape, corrosion, defective safety-valves, defective pressure gauges, defective water gauges, defective feed apparatus, defective blow-out apparatus, over pressure, and deficiency of water. The defects not actually dangerous, were fracture of plates and angle irons, blistered plates, furnaces out of shape, corrosion, safety valves out of order, pressure gauges out of order, water gauges out of order, feed apparatus out of order, fusible plugs out of order, over pressure, and deficiency of water. Corrosion and fracture are among the most important defects met with, and there were as many as 202 cases of corrosion, 22 of which were dangerous; and 62 of fracture, 11 of which were dangerous. Surface blowing-out has made considerable progress during the past year, and is now adopted by 58 members, and applied to 129 boilers. Very many of the applications of the surface blowing-out apparatus have been attended with great success, while some have not fully answered the expectation formed. The success has been greatest with muddy and sludgy waters, while common soda continues to be used with great and considerable advantage, and is found to loosen the old scale, as well as to prevent the formation of new. The number of explosions which came under notice during the year 1863 was 47. During the year there were 76 persons killed, and 80 others injured. All these accidents have happened to boilers not under the inspection of the Association, with the exception of one instance, in which case it appears, however, that facilities for thorough examination were not afforded. The causes of the 47 explosions which occurred in 1863 may he classified as follows:—14 were due to defective construction; 4 boilers failing in the shell, and 10 collapsing in the furnace tube, not from over-heating, but simply from weakness of the flue. 7 were due to defective condition of the boiler. 6 to failure of the seams at the bottom of externally flued boilers, over the furnace. 4 to shortness of water, occurring through neglect. 2 to overheating of plates, consequent upon an accumulation of sediment. 2 to excessive pressure. 1 was purely accidental. For every explosion that occurred through immediate neglect, at least four arose from the weakness of the boilers themselves, or insufficiency of their arrangements. The whole of the explosions caused by the collapse of internal flue tubes might have been prevented by the adoption of the approved means of strengthening them, such as water-pockets, flanged seams, or hoops, as well as by other well-known means. Attention is called to the large number of explosions found to result from "failure of the seams at the bottom of externally-fired boilers." Several causes combine to produce this effect. One, to which especial attention should be directed, is the admission of feed-water. This is sometimes allowed to impinge immediately upon the plates over the furnace. To prevent this, the feed pipe should be carried along horizontally for several feet and at a few inches below the surface of the water, being perforated with small holes throughout its entire length, so that the feed may be dispersed on its introduction. A second cause is the imperfect way in which these externally-fired boilers are too frequently repaired. One-sixth of the whole number of explosions appears to have been due to corrosion, by which the plates were eaten away until their thickness became so reduced that rupture ensued. Of these cases, 6 were external, and occurred in stationary boilers, while 1 was internal, and occurred in a locomotive, so that no instance of an explosion happening to a stationary boiler on account of internal corrosion was met with during the year. A very general impression exists, that all explosions arise either from excessive pressure, induced by a reckless tampering with the safety-valve, or else from the shortness of water. This opinion appears to be incorrect, for out of 36 explosions only 2 arose from excessive pressure, and 4 from shortness of water. The position at which rupture in the shell of a

boiler commences on the occurrence of explosion is a matter of interest, and it has been thought by some to exercise an important influence on its destructive character. In the 36 explosions accounted for, the rents of five boilers commenced above the water line; in a sixth, the boiler was so completely destroyed that it was difficult to determine which of the rents was the primary one; in a seventh, the boiler exploded while under test by steam alone, without water, so that consideration of this case may be dismissed; while in the 29 remaining ones, the boilers all rent primarily below the water line. In conclusion, the report says that the experience of the past year affords additional evidence of the soundness of the system of periodical boiler inspection, which this Association has both inaugurated and maintained, as well as of its sufficiency for the prevention of boiler explosions. Of this, many special illustrations were met with during the year, in which impending explosion was averted, the boilers being found, on inspection, to be in a most dangerous state, although the fact was entirely unsuspected by their owners.

Copper Paint.—The *Mining Journal* states that a new pigment, calculated at the same time to increase the resources of the decorative painter, and to afford a ready means of preserving iron and other metals, has recently been introduced at Paris by Mr. L. Oudry, of the Auteuil Electro-Metallurgic Works. He first obtains an absolutely pure copper by throwing down the metal by the galvanic process; he then reduces the precipitate to an impalpable powder by stamping. This powder is then combined with a particular preparation of benzine, and used in the same way as ordinary paint; beautiful bronzed effects are produced upon it by means of a dressing with acidified solutions and pure copper powder. The articles painted with the new material have all the appearance of electro bronze, while its cost is less than one-sixth; it will last from eight to ten years. Mr. Oudry also proposes to substitute benzine oil for linseed and other oils, over which it possesses great advantages.

Colonies.

The Customs Returns at the port of Sydney show a considerable falling off in the revenue from July to October. As, however, there was in the first six months of 1863 a great increase, as compared with 1862, there is still a satisfactory increase of 5 per cent. on the ten months ending October, 1863; the amount of revenue being £545,809 8s. against £519,401 9s. 8d for the same period of 1862.

The Post Office Money Order System in Sydney appears to work well, and each mail shows a steady increase in the issue of money orders upon the United Kingdom. The money orders sent by the September mail were 489, the amount being £2,093 6s. 7d. By the October mail there were remitted 591 orders, amounting to £2,233 16s. 1d.

Adelaide Labour Market.—The wages now offering to female domestic and dairy servants are—Barmaids, £28 to £30; dairymaids, £19 to £23; general servants, £18 to £23; good cooks, £26 to £30; housemaids, £21 to £25; kitchen maids, £19 to £22; nurses, £15 to £26; laundresses, £26; superior general servants, £26 per annum, with board and lodging.

Gold.—A private letter from Vancouver's Island, dated November, says that business has considerably improved in the last few days on account of the discovery of some promising gold fields within ten miles of Victoria, which has created a general rush on the part of all the mining population. It is calculated they will realize, on an average, at least 5 dols. per diem.

Emigration to New Zealand.—A pioneer party of emigrants, in connexion with the Church of England Emigration Society, left England lately. This society has been established for the purpose of superintending a system of emigration to New Zealand, with the view of giving to its members the benefit of co-operation in emigrating to a special settlement. The society has availed itself of the land-order system of Auckland, and the authorities of that province have promised every assistance. A block of land in the north of the province, where the natives are not in rebellion, has been reserved for the Society's emigrants.

Dutch Trade with Australia, &c.—During the last year nine vessels from Holland arrived at Melbourne, bearing 86,300 cases of Geneva, 37,744 boxes of candles, 6,945 quarters of oats, besides other goods; aud there were still, at date of latest letters, 7 vessels on voyage to Melbourne, with 135,954 cases of Geneva and 22,002 boxes of candles; one vessel for Sydney, with 15,600 cases of Geneva and 5,250 boxes of candles; also one vessel for Otago, with 4,830 cases of Geneva, 750 quarters of oats, and other goods.

Staves for Casks.—It is said that a new kind of industry is likely to spring up at Hobart-town, in the manufacture of staves for casks. These staves are of the silver wattle, of which there is an abundance in every way adapted to the purpose. Some beef sent home from Victoria and brought back again in casks made out of old wine casks with oak staves, was found to be far inferior to that in which the silver wattle was used. The pickle in the former was discoloured, but in the latter bright and clear, and the beef far superior as a merchantable article.

Export of Grain from South Australia.—The exports of flour and wheat from Port Adelaide and the outports during the first three quarters of 1863, compiled from the returns published in the Government *Gazette*, were 32,280 tons of flour and 106,619 quarters of wheat, showing an increase upon the exports of any similar period since the formation of the province. Calculating 45 bushels to a ton of flour, this would make the exports of breadstuffs, up to the end of September, equal to 51,234 tons of flour. The entire wheat crop of last harvest was supposed to be equal to 85,374 tons of flour. The demand for local consumption would leave the quantity available for export about 60,000 tons.

Obituary.

William Dyce, R.A.—The year has begun badly for the Royal Academy, bereaving it of one of its most active and valuable members, one of those highly-educated painters whom it could ill spare, and will not readily replace, either in regard to his work in the council, or that more important part of an Academician's life which appears by its results on the walls of the exhibition rooms. Dyce's services to the Academy were considerable, and often timely; it was he who proposed the institution of that admirable safety-valve—the class of retired Academicians,—which, by creating vacancies in the more active section of the body without diminishing the honour due to those who entered the new grade, enabled the association to add men to its ranks who must otherwise have waited until death created vacancies. It is not too much to say that Dyce, although not a prolific painter, did, by the usually high character and aims of his works, much more to maintain the position of the association than it is the fortune of most of his brethren to be able to perform. The Royal Academy Exhibition contained, in 1844, that picture which may be considered, on the whole, as the best of Dyce's works, "Joash shooting the Arrow of Deliverance," showing how the dying Elisha guided the hand of Joash, King of Israel, in shooting the arrow of the deliverance from Syria. Notwithstanding the dry manner of this picture, which was to a certain extent the inevitable outcome of the painter's system, it possessed qualities of design, drawing, and expression such as it is to be hoped we shall often see in the English school of art. It is precisely in this

severe direction of study and execution that our artists need practice. It is understood that Dyce contemplated to extend the subject of the above-named picture, so as to form a series of compositions, having the death of Elisha for central point, and to comprise the visit of Joash weeping for the "chariot of Israel and the horsemen thereof," to Elisha, the taking of the bow, the smiting of the arrows, that remained after that of deliverance had been shot, upon the ground, whereby the triple victories of Israel were assured; and, lastly, the recalling to life—at the touch of Elisha's bones—of the dead man whose body had been cast into the tomb of the prophet; a grand series of subjects. That period of Dyce's life which was employed in the production of this picture was undoubtedly his prime; to it were due the design, at least, if not the execution of his "Baptism of Ethelbert," now a fresco in the House of Lords. In this period was begun "St. John leading home his adopted mother," which, at its late exhibition in the Royal Academy (1860), somewhat re-established the professional position of the painter, who, soon after its commencement in 1844, seems to have felt the earliest signs of the disease which, after sapping his energies for years, terminated his life on the 14th inst. In the meantime he had carried on a large series of works successfully, although he was not at last able to complete the largest, if not the most important of all, *i.e.*, "King Arthur's Court," in the Robing-Room at Westminster. William Dyce was born at Aberdeen, in 1806; he was the son of a physician, and educated at Marischal College. At about seventeen years of age he became a student in the Royal Scottish Academy, Edinburgh, having shown some signs of ability in art before that time. Three years after this he came to London, and entered the schools of the Royal Academy as a probationer, but, disliking the system of education—then, we believe, under the charge of Henry Thompson, R.A., he went to Rome, without becoming a student. At Rome Dyce studied the works of those masters whose tastes and methods of execution most happily assimilated with his own predilections, *e.g.*, the painters of the Tuscan and early Roman schools. The *bravura* of the later Romans was not more to his taste than were the mildness and genial affectations of Henry Thompson. In 1826, Dyce returned to Scotland, and soon afterwards sent his first picture to the Royal Academy; this was, "Bacchus nursed by the Nymphs." Again he went to Rome, and from thence sent to the same exhibition "The Madonna and Child." In two years he was at Edinburgh, and painting portraits—in which, especially those of women and children, he excelled—but at the same time endeavouring to make his way as an historical painter by contributing pictures to the Royal Scottish Academy's Exhibition. In 1836 he sent to the Royal Academy's Exhibition "The Descent of Venus," from Ben Jonson's Masque, "Love's Triumph through Callipolis." The strong point of Dyce's character, appearing even in his practice of art, was an intense feeling of order, or logical arrangement and system. This qualified him to deal with many literary subjects, and made him powerful with his pen and in debate. The most effectual result of this faculty was a pamphlet on Art-education, which appeared in 1837, and procured Dyce the offices of superintendent and secretary to the committee charged with the management of the Schools of Design. While in this office he made a report on the Continental systems for diffusing Art-education among the people, which remained for some time a text-book in this country. In 1844, Dyce resigned his connection with the schools of Art. He was elected A.R.A. in 1844—the year of painting "Joash shooting the Arrow of Deliverance"—and Royal Academician in 1849. In 1846 he began the fresco, "Neptune assigning to Britannia the Dominion of the Seas," a sufficiently absurd subject. In 1847 he began "The Baptism of Ethelbert." In 1848 the series of frescoes in the Robing-Room at Westminster, from "The Legend of King Arthur," was begun; and about the same time the painter was, with others, commissioned to execute a fresco in the Summer-house of Buckingham Palace, the subject being from "Comus." About 1850, the paintings in All Saint's Church, Margaret-street, were begun. Dyce wrote several pamphlets on art subjects, and was an active champion of his own views in art, which had, to say the least of them, a strict logical consistency, and if men would but be bound by logic only, were absolutely perfect. He was founder of the "Motett Choir," now merged in the Ecclesiological Society, and intended for the revival of ancient church music. The most valuable of Dyce's works, excluding those above named, are as follows:—"Titian and Irene da Spilembergo" (1840), "Madonna and Child" (1846, Manchester, 1857), "The Meeting of Jacob and Rachel" (also at Manchester, 1857), "King Lear and the Fool in the Storm" (1850), "The Man of Sorrows," and "Pegwell Bay" (1860).

Publications Issued.

Statistics and Observations on the Mines of Cornwall and Devon, illustrated by maps, plans, and sections. By Thomas Spargo. (*Vincent and Green.*) The statistical statements are framed to elucidate the products and realised prices of the ores raised in the respective mining districts for the years 1860 to 1862 inclusive. A classification is made of the various mines in each district, illustrated by ground-plans, distinguishing the mines in each class; and in many instances the observations of the writer embrace an account of the condition and prospects of the mine to which the reader's attention is called. The tables are stated to be founded on data furnished by each mine, and show the quantity of tin, copper, and lead ore raised in the respective districts, and of the lead yielded and silver extracted in each lead mine.

Notes.

School of Naval Architecture.—For the first time since Sir James Graham was First Lord of the Admiralty, a vote is to be submitted to Parliament for a School of Naval Architecture. And at p. 28 of the navy estimates for the year 1864-5, recently laid before Parliament, appears a sum of £2,300, "for School of Naval Architecture and Maintenance of Students in the same." The discussions which have taken place in the house of the Society of Arts have provoked this result. Government has not yet furnished any further particulars of its intentions in this matter; but a report is current that the school will be opened, not merely for the use of the navy, but also for the mercantile marine, and that it is to be organized on a self-supporting system as far as practicable. It is said that the students not paying fees will be admitted by open competition.

Emigration from Germany.—During the year 1863 the number of emigrants from Hamburgh was as follows:—To New York, 15,692; Quebec, 2,674; Australia, 2,525; Brazil, 799; Chili, 176; and 2,815 went indirect; total, 24,681, against 20,077 in the year 1862. From Bremen, the emigration was:—To New York, 16,373; Baltimore, 1,085; Brazils, 86; Chili, 408; total, 17,952, against 14,710 in 1862.

Trade Marks.—The Board of Trade have published in the *Gazette* of the 12th of February the following translation of Article 258 of the Saxe-Coburg Penal Code, relative to trade marks, which has been recently adopted by the Duchy of Nassau:—"Whoever imitates stamps or particular marks by which wares or manufactures of a particular house of business, or of a particular manufactory, are indicated, and whoever uses them or the label of a house of business for the purpose of deceiving the trade, is subject to a punishment of imprisonment for a period not

exceeding two months, it being understood that the prosecution be instituted at the instance of the house in question." This decision applies not only to natives but also to foreigners.

SUBMARINE VESSEL OF WAR. — Experiments were recently made in the port of Rochelle to test the qualities of a submarine vessel of war, the invention of Captain Bourgeois, of the French navy. The vessel was stated to be so constructed as to admit of being almost instantly submerged by compressed air and a peculiar apparatus with which it was provided. The only part that remains visible is a small tower, whence the commander may observe the position and motions of the ship to be attacked, and direct his men which way to steer in order to strike her hull with the formidable spur which constitutes the chief means of attack of the new contrivance. The experiments were not satisfactory, but the first trial met with indulgence from the spectators, it being the opinion of many present that, with some improvements, the new contrivance might become a terrible engine of war.

VACCINATION OF SHEEP.—Mr. Lowe stated in the House of Commons, on Tuesday evening last, that the experiments which had been instituted by the Government were concluded, and that the result was not satisfactory. The report would be ready by Easter. The experiments were of two kinds. In the one the sheep were vaccinated with lymph taken from the human subject. That method had succeeded up to a certain point. The sheep took the disease, though in an irregular and abnormal form. When, however, they came to test the use of the vaccination thus effected, it was found that the sheep freely took the disease afterwards, either by inoculation or in the natural manner, from other sheep. The second experiment was to inoculate with matter taken from sheep suffering under small pox, in order to produce a vaccine disease which would stand in the same relation to sheep as cow pox to the human subject. They had entirely failed in producing that disease in the cow.

MULREADY EXHIBITION.—The arrangements for the Mulready Exhibition at the South Kensington Museum are sufficiently advanced to enable it to be opened to the public on Saturday, the 12th of March. The private view will take place on the previous day (Friday). Great liberality has been shown by the proprietors of Mr. Mulready's works, headed by Her Majesty and H.R.H. the Duke of Cambridge, in consenting to lend them for exhibition; and a large collection of his finished pictures, sketches, studies, and drawings, arranged as far as possible in chronological order, will be displayed on the walls of a portion of the Museum galleries.

MEETINGS FOR THE ENSUING WEEK.

MON. ...British Architects, 8.
Actuaries, 7. Mr. J. Meikle, "On the Determination and Distribution of Profits."
Medical, 8½. Dr. Edward Smith, F.R.S., "The Emission of Urea and other Excretory Products, under the influence of numerous agencies."
Pathological, 8.
R. United Service Inst., 8½. Capt. J. H. Selwyn, R.N., "Armoured or Iron-clad Ships: their Advantages and Defects."
R. Academy, 8. Mr. R. Westmacott, R.A., "On Sculpture."

TUES. ...Civil Engineers, 8. Renewed discussion upon Mr. Sopwith's paper, "On the Mont Cenis Tunnel."
Med. and Chirurgical, 8. Annual Meeting.
Photographic, 8.
Anthropological, 8.
Royal Inst., 3. Prof. Marshall, F.R.S., "On the Morphological Phenomena of Animal Life."

WED. ...Society of Arts, 8. Mr. Charles Tomlinson, "On the Verification of Olive Oil by means of its Cohesion Figure."
Pharmaceutical, 8.
R. Society of Literature, 8½.

THUR. ...Royal, 8½.
Antiquaries, 8.
Linnæan, 8. 1. Dr. Hooker, "On the Identity of *Pinus Pence* of Macedonia with *P. excelsa* of the Himalaya." 2. Mr. S. Ward, "On the Double Cocoa-nut of the Seychelles. 3. Dr. H. Criger, "On the Fecundation of Orchids." 4. Rev. M. J. Berkeley, "On the Fructification of *Chionyphe Carteri.*"
Chemical, 8. Prof. Abel, "On the Non-Metallic Impurities of Refined Copper."
R. Society Club, 6.
Royal Inst., 3. Prof. Marshall, F.R.S., "On the Morphological Phenomena of Animal Life."

FRI. ......Philological, 8.
Royal Inst., 8. Professor Stokes, "On the Discrimination of Organic Bodies by their Optical Properties."
R. United Service Inst., 3. 1. Lieut. A. H. Gilmore, R.N., "The Application of Electric Telegraph to the Steering and General Management of a Man-of-war." 2. Capt. H. F. McKillop, R.N., "Flexible Coffer-dams for Cleaning and Repairing Ships afloat."
Archæological Inst., 4.

SAT. ...Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."
R. United Service Inst., 2. Annual Meeting.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered during the Vacation, 1863.

486. Transatlantic Telegraphic Communication—Return.
45 (VI.) Trade and Navigation Accounts (30th June, 1863).
487. Ordnance—Report from Committee.
383. Poor Relief—Report from Committee.
431 (A 1). Poor Rates and Pauperism—Return (A).
453. Army (Clothing Factories)—Returns.
466. Shanhai—Return.
468. Naval Prize Money, &c.—Account.
476. Canada (Military Equipments)—Return.
479. Friendly Societies (Scotland)—Report by the Registrar.
497. Army (Commissions)—Return.
511. Local Lighthouses—Paper.
504. Emigration—Return.
508. Colonial Governors—Return.
495. Dublin and Edinburgh Corporations—Return.
517. Broadmoor Criminal Lunatic Asylum—Paper.
532. Holyhead Harbour—Return.
482. Church Building and New Parishes Acts Amendment Bill—Report from the Select Committee.
424. Inland Revenue and Customs Establishments—Report.
494. Public Institutions—Return.
510. Goodwin Sands—Return.
526. Income and Property Tax—Returns.
539. Ecclesiastical Revenues (Durham)—Return.
542. Kingstown and Holyhead Mails—Return.
128. Highland Roads and Bridges—Final Report of Commissioners.
473. East India (Public Works Department)—Returns.
480. Rajah of Coorg—Correspondence.
503. Fines and Penalties (Ireland)—Abstract of Accounts.
523. Oude Claims Inquiry—Copy of Letter.
551. Jesuits—Return.
445. Holyhead Harbour—Report.
469. Imports and Exports, &c.—Returns.
478. Gas (Metropolis)—Accounts.
489. Lancashire, &c., Unions—Returns.
492. Railways—Return.
493. Import and Export Duties—Return.
512. Abeokuta—Letter from the Reverend H. Venn.
519. East India (Captain Frith)—Papers.
521. East India (Lieutenant Torckler)—Papers.
524. Oude Claims (Asoph-ul-Dowlah)—Memorial.
525. Stornaway Foreshore—Petition by Sir James Matheson.
530. Vessels and Tonnage, &c.—Return.
536. Navy (China Seas)—Return.
549. Metropolitan Rates—Return.
552. Coast Guard Stations—Returns.
555. Railway Trains (Redhill)—Returns.
45 (VII.) Trade and Navigation Accounts (31st July).
161. Public Health—Fifth Report of the Medical Officer of the Privy Council.
431 (A II). Poor Rates and Pauperism—Return (A).
454. Thames Conservancy, &c.—Report.
470. Sugar—Copies of Letter, &c.
500. Metropolitan Railway Communication—Lords (First Report).
500. ,, ,, ,, ,, (Second Report).
516. Standing Orders of the House of Commons.
153. Navy (Pay of Officers)—Return.
260. County Treasurers—Abstract of Accounts.
500 (II.) Metropolitan Railway Communication—Lords (Third Report).
502. Cloone Loan Fund—Correspondence.
543. Mail Service (Australian Colonies)—Correspondence.
556. Bankruptcy Court—General order.
310. Assurance Companies—Return.
457. Ecclesiastical Commission—Report.
522. East India (Army)—Return.
271. East India (Progress and Condition)—Statement.
499. Prison Discipline—Lords Report.
527. Savings Banks (Ireland)—Returns.
488. Timber in Dockyards—Return.
151 (I.) Rotherham Sanitary Condition—Report.
205. Grand Jury Presentments (Ireland)—Abstract of Accounts.

264. Pilotage—Abstract of Returns.
541. East India (Tringanu)—Papers.
548. Metropolitan Assessments—Returns.
45 (viii.) Trade and Navigation Accounts (31st August).
431 (A iii.) Poor rates and Pauperism—Return (A).
487. Ordnance—Report and Evidence.
513. China Indemnity—Statement.
546. Militia and Volunteer Officers—Return.
547. Army (Lieutenant-Colonels)—Return.
544. Census of England and Wales—Returns.
431 (A iv.) Poor Rates and Pauperism—Return (A).
529. Admiralty Droits—Return.
550. Circuits (England and Wales)—Return.
491. Lighthouses, &c. (Ceylon)—Return.
493 (i.) Import and Export Duties—Return.
498. Banda and Kirwee Booty—Correspondence.
100 (i.) Poor Relief (Lancashire, &c.)—Return.
402. Woods, Forests, &c.—Forty-first Report of Commissioners, &c.
496. Local Taxation—Returns (1863).
45 (ix.) Trade and Navigation Accounts (30th September).
449. Friendly Societies (England)—Report of the Registrar.
501. Navy (Promotion and Retirement)—Report.
533. Licences (Ireland)—Return.
457. Ecclesiastical Commission—Report from Committee.
271 (i.) East India (Progress and Condition)—Paper (Part II.).
133. Health of the Navy—Statistical Report.
490. Local Lighthouses—Returns.
463. Newcastle-upon-Tyne Trinity House—Return.
431 (A v.) Poor Rates and Pauperism—Return (A).
416. Sheriff Courts (Scotland)—Return.
483. Spirits and Wine—Return.
518. Roman Catholic Pauper Children (Scotland)—Return.
535. Exchequer, &c.—Accounts.
45 (x.) Trade and Navigation Accounts (31st October, 1863).
431 (A vi.) Poor Rates and Pauperism—Return (A).
537. Malta New Dock—Return.
554. Bankruptcy—Return.
534. Supply—Return.
545. Madagascar—Return.
45 (xi.) Trade and Navigation Accounts (30th November, 1863).
520. Poor Removal—Returns.
431 (A vii.) Poor Rates and Pauperism.
493 (ii.) Import and Export Duties—Return.
99. Cost of Relief (Lancashire, &c.)—Returns.
514. Ditto ditto Return.
507. Vancouver Island—Correspondence.
531. Savings Banks—Return.
221. Bill—Court of Session (amended).
Census of Ireland for the year 1861, Vol. II. (Area, Population, &c.), Part I.
Brazil—Statement of Owners of the Vessel "Prince of Wales."
Census of Ireland for the year 1861, Vol. II. (Area, Population, &c.), Part I.
" " Vol I. (Ages and Education) Part II.
" " Vol. III. (Area, Population, &c.), Part I. (Armagh).
" " " " (Cavan).
" " " " (Donegal).
" " " " (Down).
Inland Revenue—Seventh Report of Commissioners.
Tariffs—Return.
English and Irish Law and Chancery Commission—First Report.
Manufactures, Commerce, &c. (No. 6)—Reports by Her Majesty's Secretaries of Embassy.
Greece—Correspondence.
North America (No. 14)—Correspondence.
Poor Law Board—Fifteenth Report.
Census of Ireland (1861), Vol. III. (Area, Population, &c.), Part I. (Monaghan).
" " " (Londonderry).
" " " (Fermanagh).
Greece—Correspondence with Russia.
Census of England and Wales (1861), Vol. II. (Ages, Civil Condition, &c.).
Census of Ireland (1861), Vol. III., Part I. (Area, Population, &c.) (County of Antrim).
" " (County of Tyrone).
" Vol. IV., Part I. (Area, Population, &c.) No. II. (County of Leitrim).
" " " No. III. (County of Mayo).

Patents.

From Commissioners of Patents Journal, February 19th.

Grants of Provisional Protection.

Alarum, &c.—244—G. Canouil.
Aluminium, manufacture of—266—W. E. Newton.
Anchors—242—H. A. Bonneville.
Animal substances, oils from—167—R. Irvine, T. Richardson, and J. J. Lundy.
Batteries, submarine—260—E. T. Hughes.
Bonnets, &c., manufacture of—309—R. A. Brooman.
Chimneys, cure of smoky—255—N. Fellows.
Colouring matters, violet—329—F. A. Laurent and J. Casthelaz.
Colours, separation and purification of—301—E. Lucius.
Egg-boiling apparatus—290—J. Durrant.
Filtering, apparatus for—307—R. Owen.
Fire-arms, breech-loading—297—T. Newton.
Frillings, manufacture of—323—S. W. Mulloney and G. Johnson.
Gas burners—284—J. W. D. Brown and J. Williams.
Gold, &c., separating from quartz, &c.—2483—R. A. Brooman.
Gun carriages, &c.—353—H. D. P. Cunningham.
Harrows—186—J. Shaw.
Insects, destroying—226—J. Zacherl.
Instruments, writing—291—H. Gardner.
Iron ships, &c., protecting from corrosion—335—J. C. B. Salt.
Lifting jacks—282—A. B. Childs.
Liquids, separation of, from solid substances—250—T. M. Heathorn.
Metals, moulds for casting—234—W. T. Bury.
Metals, wood, &c., composition for coating, &c.—276—W. H. B. Castle.
Motive power engines—345—J. H. Johnson.
Oil cans—317—J. Kaye.
Paper, manufacture of—333—J. Easton, jun., and T. Leigh.
Pavement, artificial—268—A. Prince.
Percussion caps, &c.—293—G. T. Key.
Pictures, coins, &c., apparatus for viewing—270—C. J. Rowsell.
Pictures, mounting—305—J. Lee and J. Thomson.
Piers, embankments, &c., piles for—258—J. Phillips.
Printing—248—H. A. Davis.
Printing rollers, maundrills for—319—C. Mather.
Pumps, &c.—254—A. Tozer.
Pumps, rotary—264—E. Myers and H. D. Gloag.
Railway breaks—262—W. Clark.
Railway carriages, springs for—256—D. A. Burr.
Railway rails, manufacture of—343—F. W. Webb.
Rings, &c., manufacture of—274—D. Anderson.
Saponaceous compounds—2589—W. Cooke.
Screw steamers for naval warfare—325—R. H. Napier.
Shaping machines—240—W. Winter.
Soap, manufacture of—238—W. E. Newton.
Stays, &c.—252—P. A. L. de Fontainemoreau.
Steam engines—313—B. Lupton, S. Whittaker, J. Whittaker, and E. Hartley.
Steam engines, valve gearing of—288—T. Beams.
Stenographic apparatus—295—R. A. Brooman.
Sunken ships, &c., apparatus for raising—236—E. W. James.
Tar, treatment of—170—G. Lander.
Telegraph cables, &c., covering—241—N. J. Holmes.
Tobacco cutting machines—331—E. Welch.
Weaving—272—J. Clegg, J. Smith, and W. Carnelly.
Weaving, take-up apparatus used in—246—J. Kershaw.
Weighing machines—2585—G. Haseltine.
Wire, bending and cutting—3214—I. Coombs and J. T. Pendlebury.
Yarn, sizing and drying—303—J. C. Dickinson.

Invention with Complete Specification Filed.

Motion lever—349—J. B. Borgatta.

Patents Sealed.

2085. A. Watson.	2133. G. Lowry.
2088. S. Moore.	2161. J. H. Banks.
2095. A. Capello.	2530. S. Flexen.
2098. R. A. Brooman.	2941. J. Steart.
2104. T. Hopkins, jun.	3118. E. Darwen and J. Haddon.

From Commissioners of Patents Journal, February 23rd.

Patents Sealed.

2099. A. Hett and F. W. Basset.	2146. H. E. Kramer.
2102. J. W. Friend.	2177. N. Bailly.
2103. J. Thomas and W. F. Marshall.	2197. F. Mills, T. Booth, and T. Clegg.
2106. J. L. Kessler.	2198. J. B. York.
2109. R. Johnson and G. Bedson.	2258. G. W. Billings.
2111. J. Platt and W. Richardson.	2286. J. H. Johnson.
2115. T. Bourne.	2342. P. A. Le Comte de Fontainemoreau.
2117. J. Clark.	2582. N. F. Taylor.
2118. J. Ward.	2835. G. K. Geyelin.
2123. R. Bell.	3039. W. E. Newton.
2130. J. Walls.	3244. R. E. Van Hees.
2131. H. C. Pennell.	3289. N. F. Taylor.
2138. D. Speirs, A. Boyd, and J. Kirkwood.	3295. A. Whitelaw.

Patents on which the Stamp Duty of £50 has been Paid.

455. R. Mushet.	557. W. H. Haseler.
473. R. Mushet.	469. L. Pohl.
399. J. H. Johnson.	435. D. Evans.
430. J. J. Miller.	450. W. Walker.
422. G. Parsons.	453. A. Barclay.

Patents on which the Stamp Duty of £100 has been Paid.

488. T. Clayton.	467. F. B. Houghton.
477. T. W. Davenport and S. Cole.	479. D. Cheetham.
530. C. H. Murray.	535. J. Milnes and W. Thompson.
930. A. Paget.	524. J. Brown.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, MARCH 4, 1864. [No. 589. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

MARCH 9.—"The Science of Fish-hatching." By Frank Buckland, Esq., M.A., F.Z.S., late 2nd Life Guards. On this evening Professor Owen, F.R.S., will preside.

MARCH 16.—"On the Organisation of the Corps Impérial des Ponts et Chaussées in France." By GEORGE R. BURNELL, Esq.

MARCH 23.—Passion week. *No meeting.*

CANTOR LECTURES.

The next lecture of Mr. Burges's course will be delivered on Monday next, at eight o'clock.

MAR. 7.—LECTURE V.—*Gold and Silver.*—Antique and Mediæval plate; modern ditto (Elkington); Antique and Mediæval jewellery; modern ditto; Antique and Mediæval coinage; modern ditto.

MAR. 14.—LECTURE VI.—*Furniture.*—Mediæval furniture, oak and painted; Renaissance; 16th and 17th centuries; modern.

MAR. 21.—LECTURE VII.—The Weaver's art; Mediæval, Eastern, modern.

MALTA EXHIBITION.

The Marquis Testaferrata Olivier, the President of the Society of Arts of Malta, has informed the Council that it is intended to hold, in Malta, in April next, a general Exhibition of the Arts and Industry of the Islands of Malta and Gozo. The nobles and gentry of Malta have guaranteed the expenses, and the Government have granted the use of a magnificent Public Hall for the purpose.

SUBSTITUTES FOR GUTTA-PERCHA.

The following particulars in reference to the *Balata*, stated in last week's *Journal* to have been sent over by Sir W. Holmes from British Guiana, have been received. Sir William Holmes says :—

By the last mail I received your "Subjects for Premiums" for the session of 1863-64.

My object in addressing you is to advise, that by this packet I forward a box containing samples of *Balata* in its milky state, and also dried or coagulated. I entertain the hope that these samples fully meet the requirements of the 77th Section of your list of premiums, in reference to a substitute for india-rubber or gutta-percha, but I also trust it will be found more valuable than india-rubber or gutta-percha by themselves, possessing much of the elasticity of the one and the ductility of the other, whilst it requires a much higher temperature to melt or soften it.

After these preliminary observations, I must go somewhat into detail. I was Commissioner, representing the colony of British Guiana, at the International Exhibition of 1862. Amongst the varied contributions from the colony was a morsel of the dried milk of the bullet tree (*Sapota Mulleri-Miq ?*); it weighed perhaps half a pound. Amongst the numerous individuals who visited the Guiana department was Mr. Chas. Hancock, who is well known in the gutta-percha trade. This gentleman was struck with the appearance of the specimen, and obtained a portion for experiment; he reported favourably as to its utility and value, a result most gratifying to me, as I had received adverse opinions from less experienced persons. This happened, I think, in July, 1862. From that time to the present I have been engaged in investigations how to produce the material cheaply, and how to dry or coagulate it rapidly. In both particulars I believe I have succeeded so far as to warrant the importation of steam machinery to be applied to its extraction, and by a fortunate accident I have discovered how to dry or coagulate it, preserving the characteristic of elasticity at a single operation, by the addition of a simple ingredient not very costly.

The samples forwarded consist of—1stly, a bottle of milk, as extracted from the tree by tapping; 2ndly, of lumps or cakes, weighing together five lbs., of this milk prepared for the market; and 3rdly, some balls to show, by the result of the process discovered by me, that this material is nearly as elastic as india-rubber; indeed, as far as I can judge, *Balata* cannot be rivalled by either that material or gutta-percha, possessing, as I before stated, much of the elasticity of the one and the ductility of the other, without the intractability of india-rubber or the brittleness and friability of gutta-percha. Amongst the useful properties possessed by *Balata*, I believe the fresh-milk of the bullet tree to be the best waterproofing material yet discovered, and further, that *Balata*, as prepared by me, will supply the great want of the day, as a good insulating medium for telegraphic purposes.

The bullet tree is a magnificent timber tree, often squaring 30 to 40 inches, and is much used, especially in Berbice, for building purposes. The milk, when quite fresh, is so bland that it is sometimes used as a substitute for cow's milk, and the fruit is delicious.

The bullet tree abounds in many districts of the colony; indeed, I may say, throughout this part of South America, and I trust that *Balata* may ere long be added as an important item to the exports of the colony, and tend to prove that the International Exhibition of 1862 has in this instance also been productive of practically useful results, not only to this community, but to the interests of science and art generally.

I annex a letter from the Honourable William Walker, Government Secretary of the colony, and Chairman of the Correspondence Committee of the Royal Agricultural and Commercial Society of British Guiana, which is affiliated to the Society of Arts, in order to fulfil the conditions specified in the prospectus.

Proceedings of the Society.

CANTOR LECTURES.

FINE ARTS APPLIED TO INDUSTRY. BY W. BURGES, ESQ.

FOURTH LECTURE, MONDAY, FEB. 22.—IRON AND BRASS.

The first point noticed by the lecturer was the great employment of bronze in the classical era, it being used for most of the articles that we commonly manufacture in iron. Bronze statues were also numerous, although very liable to be melted down if the persons to whom they were erected became unpopular. Mention was made of the celebrated bronze colossi at Rhodes and Athens, as well as of several other *chefs-d'œuvre* of ancient art. Attention was drawn to the various methods employed in the decoration of bronze statues in the classic times, such as damascening, gilding, and the substitution of silver, ivory, and other substances in the eyes. As regards mediæval bronzes great stress was laid upon our own series at Westminster Abbey, so much being known of the artists and of their rate of payment; and after noticing the great antiquity of bronze castings in the East, and the great skill of the Japanese in this art, the lecturer referred to the present state of these manufactures in France and England, very little being done in our own country. In France, M. Barbédienne deservedly holds the first rank, for the extreme care displayed in the casting, although some doubt was expressed as to the expediency of copying works in marble by reducing them as bronzes. After describing the Damascened dinanderie produced at Mossul, in the 12th and 13th centuries, and Hart's and Harding's imitations of that of the middle ages, the lecturer referred to the prevalent use now made of iron, both wrought and cast, observing that at present we had no very good means of judging whether structures built of this metal were likely to be permanent, and adding that there was very great room for a much more extended application of art to engineering works than had hitherto been made. The ironwork of the twelfth and thirteenth centuries was pointed out as models to be followed in the designs for elaborate works for doors, screens, and other small objects, the ornament being obtained by means of iron stamps, while the practice of the 14th and 15th centuries, of getting the effect by placing thin perforated plates one behind another, was by no means to be so much approved. A screen, however, executed by Hardman in this manner, and placed in the late exhibition, was mentioned with great praise for its delicate workmanship. Mr. Burges concluded by strongly advocating the application of art to works in cast-iron, and by suggesting several methods whereby this might be decorated. The table presented a most interesting show of works in bronze, Messrs. Jackson and Graham having kindly lent a selection of the best productions of M. Barbédienne; Messrs. Aubert and Linton also lent some fine bronzes and specimens of or-molu work. Mr. Wareham contributed some very curious Chinese and Japanese figures and vases, while Messrs. Hart and Son and Messrs. Hardman contributed some fine specimens of modern ornamented brass and inlaid metal-work. The specimens of cast-iron were due to the foundry of Mr. Macfarlane, of Glasgow, and Bedford-street, London; and several bronzes and electrotypes had been kindly lent by Messrs. Elkington and Co.

TWELFTH ORDINARY MEETING.

Wednesday, March 2nd, 1864; Robert Bentley, Esq., Professor of Botany, King's College, London, in the chair.

The following candidates were proposed for election as members of the Society:—

Benham, Edward, 18, Essex-street, Strand, W.C.
Boxell, Thomas, 43, King's-road, Brighton.
Greig, Robert, 33, The Cedars, Putney, S.W.
Martin, Claude, Park-cottage, Acton, W.
Parry, Robert Seaton, Balham Hill, Surrey, S.
Robinson, S., 60, Church-gate, Stockport.
Ruddock, Samuel, 22, Bloomfield-terrace, Pimlico, S.W.

The following candidates were balloted for and duly elected members of the Society:—

Blackburn, Henry, 27, Victoria-street, S.W.
Smith, S. Pountney, The Limes, Shrewsbury.
Steele, Edwin Breare, Vauxhall-cottage, Parkhall-lane, Leeds.

The Paper read was—

ON THE VERIFICATION OF OLIVE OIL BY MEANS OF ITS COHESION FIGURE.

BY CHARLES TOMLINSON, ESQ., LECTURER ON PHYSICAL SCIENCE, KING'S COLLEGE SCHOOL, LONDON.

Probably at no period in the world's history has the olive tree been unimportant. It is mentioned not far from the first page of Sacred History, and again not far from the last. It furnishes many of the inspired writers with metaphoric illustrations; and we gather from St. Paul's writings that in his time the wild olive tree was distinguished from the cultivated variety, and that the practice of grafting was well known. In all ages the olive tree has been a source of wealth to the temperate regions where it flourishes. Italy exports vast quantities of olive oil every year; Tuscany to the value of nearly £80,000; Lucca, £40,000; the Neapolitan Provinces to the value of £740,000. In 1862 we imported 21,095 tuns of olive oil, of the value of £1,211,306 sterling, and in 1803, 19,866 tuns. The oil is consumed for the purposes of eating, for perfumery, soap-making (the finest Castile soaps are from olive oil), for the woollen and other manufactures, and for lubricating machinery.

Connoisseurs in olive oil admire the fruity taste, for which purpose the French growers in Provence gather the olives shortly before they have arrived at maturity. If the fruit is left till it is quite ripe it yields an equally fine oil, but has no taste of the olive. If the fruit is too ripe the oil is fatty and liable to become rancid. For the finest or virgin oil the olives are placed under shelter, in thin layers, for from twenty-four to forty-eight hours, until they begin to shrivel, but for the ordinary oil they are left in heaps for weeks, and even months, in the course of which fermentation sets in, which, it is supposed, increases the quantity of oil or enables it to separate more easily from the vegetable mucilage. If the olives get mouldy, or stick together, or discharge a reddish liquor, or rise in temperature to nearly 100° F., an acrid oil is produced, fit only for soap-making or the woollen manufacture.

For getting out the oil the fruit is crushed under edge stones, put into bull-rush mat bags, and slowly pressed in a screw press; the oil is received into casks or stone cisterns, filled about two-thirds with water. This is the finest or virgin oil. The contents of the bags are mixed with boiling water, turned once more into the bags, and pressed again. As the oil accumulates on the surface of the water it is skimmed off with flat ladles; it forms a good eating oil, but is apt to become rancid. The water also contains a quantity of oil entangled with the mucilage. By long repose in a large cistern it gradually parts with it, the water is drawn off at the bottom, and the oil that is collected is used in manufactures. The mass is next crushed at the mill, treated with boiling water, and expressed, when a still coarser oil is produced. All the oils are fined by keeping about twenty days in clean tuns, at a temperature not under 60°. The oil is then run off into strong casks, left to cool in cellars, and is ready for the market.

It is calculated that 100lbs. of olives will yield 32lbs. of oil, 21lbs. of which are from the pericarp, forming the finest oils, 4lbs. from the seeds, and 7lbs. from the woody matter of the nut; but the latter oils have an unpleasant flavour, and both soon become rancid. The oil of the skin resembles that of the flesh, but contains an

essential oil in addition, so that the olive, when perfectly mature, contains no less than four different oils.

In Spain the olives are left a considerable time after gathering, and hence the oil has a greenish colour and a strong taste, which, indeed, the Spaniards prefer. The olives are first pressed between conical rollers, kept a certain distance apart to prevent the kernel from being injured, after which the oil is drawn by pressure.

Italy and the Italian islands may be considered as the classic land of the olive. The trees grow to a large size and the cultivated varieties are numerous. The climate is well adapted to the plant, which requires a mild winter for its safety, and a hot summer and autumn for maturing its fruit. The finest oil, known as sublime and extra-sublime, is prepared from perfectly sound olives, gathered by hand, instead of the rude method of beating them from the trees, as in France, and they are not allowed to ferment. Such an oil is perfectly transparent, of a deep rich yellow colour, with much body, moving sluggishly when shaken, and keeping two or three years without contracting a disagreeable taste or smell. The Italians prefer the oil with a fruity taste; *con multo frutto* as they call it, or as the French say *qui sente son fruit.* For the English market an oil is prepared with very little taste or smell. It is remarkable that new olive oil has a pungent taste, like that of pepper, a property common to all the best oils; it goes off in from three to sixweeks, and is, I imagine, due to the essential oil of the skin. Still, however, the oil of Bari has a pungency which is not only excessive, but permanent.

The finest oils are produced, perhaps, in Tuscany, but once in about four years Bari furnishes oils equal to those of Tuscany, but differing from them in four particulars:—(1) In being paler; (2) in being more pungent and the pungency permanent; (3) in having less body; (4) in not keeping so long. Tuscany produces a variety known as white sublime oil, which is mostly sent to Paris. In extra sublime oil the qualities of the sublime are carried out to a very high degree. The Tuscan sublime oil may be regarded as the type of the eating oils. There are other qualities obtained by a second pressure of the pulp, known as superfine and fine. These do not depart so far from the type as to prevent them from taking rank as eating oils. Oils from Genoa and the Riviera are inferior to those of Tuscany, and are known in commerce as No. 1, No, 2, and No. 3; but No. 3 scarcely takes rank as an eating oil. Some of the inferior oils, produced by treating the pulp with boiling water, are used for burning, soap making, &c., and the last yield is a green, half-concrete oil, used in manufactures. The oil-cake is used for feeding cattle.

Tuscany oil is shipped from Leghorn in pipes of about 110 gallons; in hogsheads of 60 gallons; in quarter casks of 30; in jars of 20 to 21 gallons; in half jars of 10; and in quarter jars of 5 gallons. The jars are glazed on the inside, but there is a considerable absorption of oil, often amounting to 2 gallons per jar. The jars are packed in basket-work or cord netting. The oil is also imported in half-chests, containing 2½ gallons, in 35 flasks, and also in square boxes. A plain flask * of oil, with its straw covering, weighs 14 ounces, but there is a smaller kind weighing 12 ounces. The pipes on board ship leak somewhat, but a leakage of two gallons per pipe is not complained of. The half-chests and boxes suffer from the depredations of rats and mice; they nibble away the bladder and wool that stop the flask, and get at the oil by inserting their tails in the neck.

The oil contracts considerably in freezing, so that a pipe of frozen oil will gauge several gallons less than when quite liquid; sellers are sometimes cheated in this way. There is an idea in the trade that frozen oil should be thawed by putting the vessel in hot water, because a dry heat near the fire has a tendency to turn the oil rancid.

The plant is subject to the attacks of insects, in which case the oil will not readily become bright, and the flavour may be rotten and unpleasant. Frost is a great enemy to the olive tree, as it makes the fruit fall before it is matured.

A large part of the old Neapolitan kingdom, forming the heel of the boot, is all but one continuous olive grove, but the quantity of fruit varies considerably in different years, so much so as to affect the very idiom of the language, so that one in a gay humour is said to be as merry as if he had *la buon' annata*, or the "good year of olives;" so a man in a bad humour has had *la cattiva annata*, or the "bad year of olives." Indeed, the short words yes and no (*si e no*) have reference to good and bad crops. The great depôt for oil is at the seaport of Gallipoli, which has given its name to the oil which is so largely imported for manufacturing purposes, especially in the woollen trade. The town is built on a rock, which is cut into huge cisterns for the reception of the oil, where it clarifies, and can be kept for a long time without turning rancid. A Gallipolitan warehouse is usually on the ground-floor, and, on entering, one is struck by the appearance of circular holes in the floor about two feet in diameter, like the mouths of wells. These are the mouths of separate cisterns in which the oil, in its different stages, is preserved. In fact, a turbid oil, almost as black and thick as pitch, becomes bright and yellow in these cisterns. The oil is brought in sheep or goat skins on the backs of mules, from the different towns and villages in the Terra d'Otranto, or the more distant province of Bari. When the oil is to be shipped it is drawn off from the cistern into skins, and so conveyed on men's shoulders to a small house on the sea-shore, and discharged into a large open basin or measure. From this a tube communicates with a cock outside the house, from which the casks are filled for the ships' cargo.

The olives which furnish the Gallipoli oil are allowed to mature on the tree, and when they have fallen are picked up by women and children. The machinery for pressing and crushing the oil is of the rudest kind, but it is hoped that the improved political condition of Italy will rapidly extend to the south the various improvements which have already been or are being made in the north.

An oil that fetches a wholesale price of from 5s. to 7s. per gallon offers many inducements for admixture with cheaper oils; and there are two oils which are chiefly employed for the purpose; the first is sessame oil, which is largely crushed at Marseilles from seeds chiefly obtained from the Levant, and much used for food in the south of France by the lower orders.* It is usually mixed with olive oil when the latter is dear. But the best substitute for olive oil is that obtained from the seeds of the tall white poppy; this is extensively prepared at Lille in the north of France, and also at Marseilles.†

There is no good method of detecting these admixtures, and, indeed, few things are more difficult than the determination of the purity or want of purity of any given fixed oil. I am told that an easy method of discriminating between different oils in common use,

* There are several kinds of flask, known as plain, fancy, ribboned, decanters, pyramids, and squats. The last three sorts are packed in square boxes; the first three in half-chests, shaped like a Noah's ark.

* According to Lindley ("The Vegetable Kingdom, 1846,") the seeds of *sesamum* are expressed in Egypt in great quantities. The oil is sometimes called *gingilie* or *gingelly oil*, and if of very good quality is used for adulterating oil of almonds. It is as tasteless as olive oil, but is apt to become rancid.

† The seed of poppy is generally in no degree narcotic. According to Lindley, "the oil obtained from the seeds of *Papaver somniferum* is found to be perfectly wholesome, and is, in fact, consumed on the continent in considerable quantity. It is also employed extensively for adulterating olive oil. Its use was at one time prohibited in France by decrees issued in compliance with popular clamour, but it is now openly sold, the government and people having grown wiser."

with a view to the identification of pure types, as well as admixtures, would be a great boon to the oil trade. Such a test I venture to propose to-night. It is a physical test, based upon the two forces of cohesion and adhesion. If, for example, we gently deposit a drop of oil on the surface of chemically clean water in a chemically clean glass, the adhesion of the surface spreads the drop of oil out into a film; the cohesion of the oil strives to resist this diffusion, or, yielding for a moment, the cohesion re-asserts itself, and the oil gathers itself up in opposition to the adhesive force, and the result of this struggle is a figure, which I name a cohesion figure. I believe that every independent liquid, that is not a solution, has its own peculiar cohesion figure. The figure may be represented by the functional equation $F = f\ (C\ A\ \delta)$, in which F is the figure, C the cohesion, A the adhesion, and δ the diffusibility. If two or more liquids could be found of different chemical composition, but alike in their physical characters, such as their specific gravity, molecular attraction and relations to heat, whereby at a given temperature they are equally fluid, limpid, or viscid, then doubtless the cohesion figures of those two liquids would be identical. I have succeeded in converting the cohesion figure of one essential oil into that of another, by dissolving camphor in one of them, but in such case other characters were introduced which disturbed the comparison.

As the cohesion figure of a liquid depends essentially on the adhesion of the surface, it is quite necessary that that surface be chemically clean. The water need not be distilled; the New River Company's water being well adapted to the purpose, but the vessel must be specially prepared. All vessels exposed to the air contract an organic film, from the condensation on their surfaces of the breath of animals, &c., and also other impurities arising from the products of combustion, dust, &c. If we attempt to clean the glass with a duster, however well we may satisfy the eye, we do not remove this organic film; or if we remove one film we substitute another from the cloth we hold in the hand, so that when the glass is filled with water, the film in question is detached, and spread over the liquid surface, effectually preventing adhesion.

The plan I recommend is to appropriate certain glasses, about four inches in diameter at the mouth, to the purpose; to wash them out occasionally with commercial sulphuric acid, to rinse with water, and after every experiment to wash out the glass with a solution of caustic potash, and to rinse with water before filling up again. The water must be allowed to come to rest before the drop is deposited. The glass rods kept for the purpose should be of the same size, and these may, for convenience, be kept in the caustic potash vessel. When one is taken out for use it should be shaken in water and wiped dry on a clean cloth. On dipping it into the oil, &c., it may be stirred round to mix the layers, if any, and then allowed to drain until the drops fall slowly, and the eye must determine when the rod is to be carried over the water so as to deposit one and only one drop, neatly and gently, without any disturbance. In this, as in all other matters, doubtless each operator will have, what the astronomers call his "personal equation," so that one man's result may not be as neat as that of another; but if the directions be attended to, sufficiently good cohesion figures will be produced. Gentlemen have come to me and have complained of their inability to get consistent figures, but on inquiry I have found their glasses not clean, or the mode of depositing the drop unsteady. I have even seen an operator let the liquid fall from a height of ten or twelve inches. Of course, in such a case the result is unsatisfactory, and with liquids somewhat heavier than water, such as creasote, carbolic acid, oil of cloves, and the heavy oil of cinnamon, such a mode would simply send them to the bottom of the vessel, whereas, if gently deposited, these liquids, though heavier than water, will form good figures on its surface. I may further remark that in the case of fixed oils it is of no use placing a second drop on the surface should the first one fail, because the first drop forms a film, whether visible or not, quite sufficient to destroy the adhesion between the surface and the second drop. This remark does not, however, apply to some of the essential oils, where a second drop will often displace the film formed by the first; but even with other essential oils, such as turpentine, a second drop will roll about on the film formed by the first drop, affording a good illustration of the spheroidal condition of liquids at common temperatures.* In the case of the ethers, alcohols, &c., their diffusibility is so great that the cohesion figure produced by them lasts only a fraction of a second. Hence, in order to study these figures with advantage, they must be repeated in rapid succession, for which purpose the liquid is to be taken up in a pipette or dropping tube, and so delivered to the surface of the water in successive drops as fast as the figures expand, contract, and disappear.

Creasote is a very good liquid with which to begin the study of cohesion figures. A single drop delivered to the surface of water may split up into a number of separate cohesion figures, or, in a warm room, form one figure about the size of a sixpence. This will last several minutes, sailing about on the surface of the water, struggling with the adhesive force which is constantly tearing from its limiting edge small portions of its substance, while the flattened drop is all the time seeking to resist this attack. It gathers itself up all round, and the result of these two actions, the adhesion of the surface which tends to spread out the figure, and the cohesive force of the creasote which tends to gather it up, gives a characteristic figure with a pulsating or crispating edge. This figure, however, is not altogether peculiar to creasote, but its duration is peculiar; for while a drop of creasote on the surface of two ounces of water goes on crispating for about seven minutes, until it is disposed of by solution (or in other words, when the adhesion of the water has entirely overcome the cohesion of the liquid), a drop of oil of cloves will go on crispating a much shorter time, and after an hour or more a portion of the drop will be left, that is, the adhesion of the water is much sooner satisfied in the case of oil of cloves than in that of creasote. There are also other differences in the appearances of the figure, as will be seen by referring to the diagrams on the wall.

It is obviously of no use to place a second drop of oil of cloves, or of oil of pepper, which behaves somewhat like it, on the surface, seeing that the first drop more than satisfies the adhesion. We may, however, place a second drop of creasote on the surface after the first has disappeared, when the struggle between cohesion and adhesion recommences in a mitigated form. The first drop is disposed of in two ounces of water in 7 minutes; the second drop disappears in $12\frac{1}{2}$ minutes; a third drop in 25 minutes, but the fourth drop gives no cohesion figure at all. These two ounces of water are now saturated; that is, the adhesive force of the water for creasote is destroyed. Increase the quantity of water and the adhesive force is restored in proportion to the quantity, and the struggle between the water and the creasote sets in again, accompanied by the characteristic figure of the creasote. Here is a specimen of carbolic acid. Its figure is very different from that of creasote, and its duration very much less. It is distinguishable in this way in a moment from creasote, and this may be of importance when it is remembered that much of the creasote of commerce is nothing more than carbolic or phenic acid.

With respect to the duration of cohesion figures the results are very variable, ranging from the fraction of a second, in the case of ether, alcohol, wood spirit, &c., to some hours in the case of some of the fixed oils. And among the volatile oils the characteristic portions of some of them are very permanent. Thus oil of turpentine flashes out into a beautiful film covering nearly the whole

* The author has a paper on this subject in the Philosophical Magazine for December, 1863.

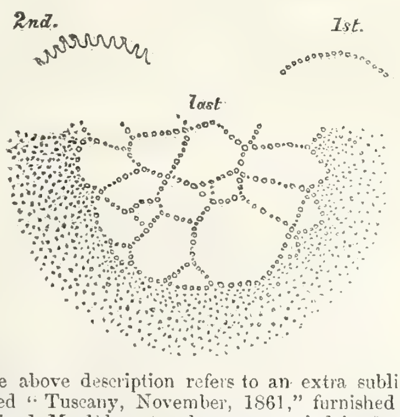
surface of the water, a double row of bosses of unequal size forms at the edge, the smaller bosses outside, bands of iridescent colour form on the surface, the film then opens into numerous small holes, and the final result is a network of great delicacy and beauty which is very persistent. Oils in the turpentine series, such as juniper, savin, cajuput, bergamot, &c., pass through these four phases with differences characteristic of each oil, often producing forms and combinations of colour of extreme beauty; and I cannot help thinking that the pattern designer might obtain hints from many of the cohesion figures for new and striking patterns.

In the production of these figures some attention to temperature is necessary. Many of the fixed oils are sensitive to the cold, so that if a drop be placed on the surface of water from a cistern, say of 40°, it may be chilled, and the experiment fail, whereas, it may be quite successful if the water be left for a time in a room at about 60° F., which may be taken as the mean temperature of an inhabited apartment in this country, both in winter and in summer.

Another precaution refers to extent of surface. By increasing this we increase the adhesive force, and the figures may be poor and thin, and even torn up before their characters can be studied. I have found a surface of four or four-and-a-half inches well adapted to this inquiry. I have also procured a number of shallow glasses, two of which are on the table; they hold only a small quantity of water, but give the required extent of surface. The stem and foot raise them to a convenient height, and the stem allows them to be easily handled without bringing the fingers in contact with the edge or inner surface of the glass. An opaque vessel, such as a saucer, is not adapted to these figures, which are difficult to see in an opaque vessel.

I have detained you thus long on the subject of cohesion figures in general, in order to show the extent of the application of this physical test. I come now to apply it to olive oil. When a drop of this oil is placed on the surface of water it spreads out slowly into a large disk with a raised edge. The cohesion of the oil soon begins to re-assert itself; the film retreats upon itself; the raised edge at first shows symptoms of the returning force of cohesion; a number of dots appear at the edge, like beads strung upon a thread, the spaces between the beads open, and the edge becomes deeply serrated; separate portions of the film gather themselves up simultaneously, leaving polygonal spaces, bounded by strings of beads or bosses, and filled with an exceedingly minute dew or spray, which requires a sharp eye to detect. All these changes occupy about 35 seconds.

Olive Oil – Extra Sublime

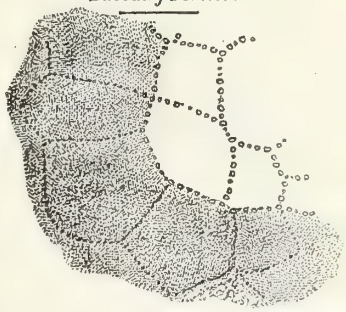


The above description refers to an extra sublime oil, marked "Tuscany, November, 1861," furnished me by my friend, Mr. Edgar, to whom we are indebted to-night for some of the statistics of the olive oil trade that I have laid before you.

Another specimen, marked "Superfine Tuscany, Nov., 1861," presented similar phenomena, but the duration was about 75 seconds. A specimen, marked "Tuscany, Fine," opened with a display of iridescent rings, a not uncommon phenomenon; these soon disappeared, and the film gathered itself up somewhat after the manner of the other two specimens.

Olive Oil

Tuscany – Fine.

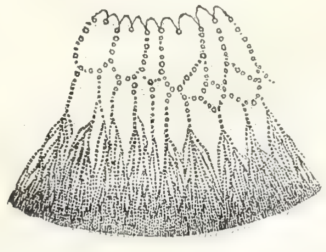


In these and other trials with oils from other parts of Italy, such as Genoa, Bari, Naples, &c., slight differences could be noticed by the practised eye, and it is quite possible that any one interested in the subject might be able to distinguish between olive oils of different growths and degrees of fineness. This, however, must be a work of time and patience, and the comparison of a large number of specimens, in order to complete that education of the eye which is more eloquent to the operator than written descriptions or pictorial designs.

Mr. Edgar, being interested in the olive oil trade, came to me and inquired whether my method would enable him to distinguish between olive oil and sessame seed oil, which is often substituted for it or mixed largely with it. After one or two meetings we were sufficiently agreed that olive oil had its own cohesion figure, and that oil of sessame has also its figure, which could not for a moment be mistaken for that of olive, or, indeed, for that of any other oil with which I am acquainted. The specimen tried was marked, "Sessame seed oil, No. 2, pressed at Marseilles, April, 1862." It forms a large, well-shaped, and well-developed film, and when cohesion reasserts itself, it retreats inwards with a deeply-scolloped edge and radiant lines of dots, leaving a pretty cobwebby figure resembling lines of cobwebs covered with dew; these phenomena last about sixty seconds. The diagram on the wall will convey, perhaps, a better idea of the figure than my description.

Sessame (No. 2)

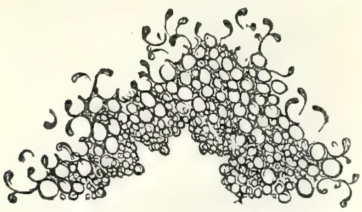
Nat. Size.



Again, poppy seed oil is often used, especially on the Continent, to mix with olive oil, and is even a better substitute for it than sessame. A specimen furnished to me was marked "Poppy seed oil, *Huile d'Oeilette*, Marseilles, June, 1860." A drop of this oil placed on water opened

quickly into a film, shooting out as it were small disks upon the surface, and forming iridescent rings, in the midst of which a perforated pattern opens, which I have attempted to represent in the diagram.

Poppy



Now, suppose olive oil to be mixed with sessame seed oil—I do not contemplate the case of sessame seed oil being palmed off for olive oil, since that would be instantly detected by its cohesion figure—but suppose sessame were mixed in various proportions with olive oil, the resulting figure would be neither that of olive nor that of sessame, but a compound of the two, the characters of the figure inclining to that of the oil in excess; so that it is quite possible, from an inspection of the figure, to say which oil is in excess, and by a few trials to produce a mixture identical with that of the fabricated specimen which was first submitted to examination. I need not say that this species of analysis may come to be of great value in the oil trade. Indeed, a gentleman in this trade, who, I believe, has long occupied a post at the Council Board of this Society, inquired of his scientific chemist whether my method was capable of distinguishing between the oleines of beef tallow and mutton tallow? "If it can do that," he remarked, "it will be a grand thing!" The chemist in question prepared his own specimens, and watched me while I performed the experiment, and the result is before you in the diagrams on the wall, by which it will be seen that the cohesion figures of these two oleines are essentially different, although the substances that produce them are apparently so much alike.

I need hardly say that mixtures of olive and poppy admit of easy detection, for, as Mr. Edgar remarked at the close of our examination of his specimens, "The oils write their names on the surface of the water!"

When I brought this subject before the British Association at Manchester two and a-half years ago, my object was rather scientific than practical. I wished to establish the principle that cohesion asserts itself in the case of liquids in the production of definite figures, as it does in the case of solids in building up crystals. The principle has, I believe, been admitted; but I have made no great progress in its practical application, partly from the difficulty I have had in procuring pure specimens, and partly, I suppose, from my preference for scientific inquiry rather than practical application.

The direction that this subject ought to take is towards the production of standard figures, and these can only result from experiments on perfectly pure specimens. I do not insist on the absolute correctness of all the figures exhibited to-night, because I have had to depend upon others for the integrity of my samples, and, in like manner, the gentlemen who have supplied me may, in their turn, have had to depend on others; so that the production of an undoubted sample is not always easy. At the International Exhibition I often watched the process of crushing linseed and expressing the oil, and obtained specimens of the results, including the seeds. I thought I had thus obtained an undoubted specimen of linseed oil; but on examining the seeds they were found to be mixed with about one-fifth of other seeds, so that my specimen of linseed oil from this source could not be relied on. Other circumstances may modify the cohesion figure, such as differences in the climate or in the season under which the crop is gathered. Thus, oil of lavender varies somewhat in specific gravity in different years from the same farm, and I have observed that the beautiful Carrigeen moss pattern produced by this oil is more minute in some specimens than in others; but the pattern is still the same in the sense that the Queen's head is the same, whether seen on a sovereign or on a half-sovereign.

In the foregoing details I have referred to water as the adhesion surface, and the figures exhibited were obtained on such surface. Of course, if the figures be produced on another liquid they will vary as the force of adhesion varies. I have obtained some very striking figures on the surface of sulphuric acid, of acetic acid, and of mercury. The last is troublesome to clean, and the two acids are spoiled in the experiment. Except as a matter of scientific interest, and as a test of the truth of the theory of these figures, there is no advantage in employing these various liquids as surfaces of adhesion. Common water, as delivered by the water companies, if contained in a chemically clean vessel, is itself chemically clean, and well adapted to the purpose.

In conclusion, I would invite the attention of gentlemen interested, whether scientifically or practically, in oils and the great variety of liquids in common use, to examine this physical test, and determine for themselves whether it may not afford a ready off-hand method of ascertaining the purity or the kind of admixture in the liquids which are daily brought under their notice.

DISCUSSION.

The Chairman said he thought it advisable, in the first place, that gentlemen present who had any knowledge on the subject, should inform the meeting as to the various modes of expressing the oil from the olives in different countries, because he found, from Mr. Tomlinson's paper, that different oils varied in their cohesion figures. That might be important for future investigation. A still more important point was to consider the different substances which were used for the adulteration of olive oil; and, following upon that, would be the means of detecting this adulteration. They had frequently heard of the struggles for life amongst the members of the organic creation, but on this occasion they had had brought before them, in a very beautiful manner, struggles of a different kind in inorganic matter; and so beautiful were some of the forms presented by these phenomena, that he agreed with Mr. Tomlinson that they would probably be taken advantage of in the designing of patterns for fabrics.

Mr. Varley inquired whether any attention had been paid to the various phenomena produced by different oils in the process of congelation and freezing. He thought it highly probable that another test might be found in the varying character of the crystals formed in different oils in the process of freezing. Mr. Varley added that some years ago he sent a communication* to the Society on "Circulation in Oil of Turpentine, Spirits of Wine, &c."

* Mr. Varley's communication appears in Vol. L. of the Society's *Transactions*, p. 190, and is as follows:—"The manner in which he made the observations was to place a small drop of the liquid on the glass tablet of his animalcula-cage, and then to screw down on it the disc of mica, or thin glass, till it touches the drop, and compresses it to the thickness of about one-fifteenth of an inch, its diameter being about a quarter of an inch. A lens from one-tenth to one-quarter of an inch focus, will show the circulation. As the particles of the above liquid are transparent in their pure state, and consequently not to be distinguished one from another, the circulation can only be shown, or rather inferred, from the apparent motion of foreign minute particles floating in the liquid, and of nearly the same specific gravity with it. If the liquid to be examined is quite clear, it may be fitted for observation by

Dr. Bachhoffner said he remembered perfectly well the experiments of Mr. Tomlinson many years ago, on visible vibrations, and in reference to the subject now before him he would ask that gentleman whether any of these cohesion figures might not be considerably modified by any tremulous motion to which the vessel might be liable. Although the vibration might not be sufficient to destroy the figure, it might, nevertheless, mislead the judgment upon the figure formed.

Mr. Bishop remarked that at Malfi, in the Bay of Naples, the olives, immense forests of which existed there, were of very small size; and all round Naples they were not so fine as in many other parts. Those of Tuscany were superior, but it was in Spain where the largest olives were to be seen. Judging from the appearance of the fruit, he should have thought the Spanish oil would, under proper manipulation, be the best that could be obtained. The olives of Spain and those of Northern Italy were very different in flavour. Those of Alicante possessed a fruity flavour, whereas those of Malfi had a peppery taste, and were altogether of an inferior quality.

Mr. G. F. Wilson, F.R.S., said one point had struck him on hearing the paper read, that Mr. Tomlinson had again illustrated what had often been seen in that room, how researches, begun in the interests of pure science, had ended in eminently practical results. Mr. Tomlinson's object had originally been rather scientific than practical, but he had arrived at results promising to be of great commercial value.

Mr. Edgar (responding to the Chairman's invitation) said the discussion of this subject was at present premature. It had not, as yet, been sufficiently ventilated. The time for discussing it would be after more extensive experience had been had of Mr. Tomlinson's process, and a larger number of facts had been ascertained. He had seen the experiments alluded to, and had repeated a great number of them, and he fully agreed as to the practical value of this discovery.

Mr. John Jones remarked that the quality of olive oil varied very much from one year to another. He would ask Mr. Tomlinson whether he was able to point out from the fruits of different years which oil was likely to remain good the longest? Because in certain delicate operations of machinery it was an object to get the very best quality of oil which would last the longest time without oxidising. Some qualities of oil would remain effective in machinery four or five years, whilst others would oxidise in less than twelvemonths. Persons who desired to send out their work very accurate, gave their personal attention to the selection of the olives from which the oil they used was extracted. They picked out only the fruit that was perfectly ripe, and they took only the first flow of the oil.

Mr. Hilton presumed the object of Mr. Tomlinson's experiments was to point out to the members of the oil trade a method of discovering for themselves perfectly genuine olive oil. He (Mr. Hilton) knew, from past experience, that perfectly genuine olive oil was an article of very limited supply in this country, but that of late years a very considerable improvement had taken place in the article of sessame oil. As there seemed to be no indication of an increased export of the finer eating oils, he would take this opportunity of asking whether sessame oil, produced from highly cultivated seeds, and deprived of all impurities and odour by refinement so as to make it almost tasteless, large quantities of which had been sent from France—whether there was any real objection to the use of that oil for eating purposes; because, if it were shown that sessame oil would serve the same purpose as olive oil, it would be a knowledge worth possessing, and would encourage a trade capable of being developed to an almost unlimited extent. With regard to the Spanish oil, it was well known to the trade to be unfit for culinary purposes in this country. The only oil used for those purposes come from Italy alone, and the quantity was not increasing. When there was a slight frost or a bad season the price of olive oil rose from £10 to £20 per ton. There had recently been a rise of £10 per ton in Italian oil, and though they might be highly delighted with these very beautiful experiments, still he was afraid, commercially speaking, they would find it difficult to procure really pure olive oils. For that reason he would ask whether there was any real objection against the use of properly refined sessame oil for the purposes to which olive oil was usually applied?

Mr. W. Hawes said the object of the present paper was not so much to introduce new oils as to teach the means of ascertaining the purity or impurity of those which were now in use. It appeared, judging from the statements in the paper, and the diagrams exhibited—and on this point he sought for information—that there was great uncertainty in the figures produced by the same description of oil under different circumstances: for instance, they were told that in one specimen of olive oil the change occupied 35 seconds, in another as long as 75 seconds, and in a third that iridescent rings were formed. It was clear that while one specimen of oil gave iridescent rings, other specimens gave a figure without them. Were they from that to understand that the oil which gave the iridescent rings was the pure oil or the reverse? or if the one was pure and the other was impure, what was the latter mixed with? He would ask Mr. Tomlinson how he accounted for the presence of iridescent rings in one figure and not in another, both figures being derived from olive oil. With regard to tallow oil and beef oil, Mr. Tomlinson, in pointing to those figures, stated that there was a similarity between them. He (Mr. Hawes) confessed he could not trace that similarity, but he should have liked to have seen the figure that would be produced by those two oils mixed together. As had been said, they had not knowledge enough of the subject yet, and they ought to feel obliged to Mr. Tomlinson for bringing these facts before them; and this might lead others to make experiments and thus to a further increase of knowledge.

Mr. Langdale suggested that it would be very valuable to the trade if Mr. Tomlinson would publish these various figures. With regard to the sessame oil, no doubt it was now being produced in a very pure state, and entirely devoid of taste and odour, and under such circumstances he thought there could be no objection to an admixture of that oil with olive oil for eating purposes. Sessame oil could be produced very pure at 4s. 3d. per gallon, while the finest sublime olive oil was about 5s. 6d. per gallon. He saw no objection to the use of sessame oil, so long as it was sold as such.

Mr. Hilton remarked that the value of sublime oil at the present time was quite 6s. 3d. per gallon.

Mr. Tomlinson, in reply upon the remarks that had been made, said, in appearing before the Society this even-

grinding with it a few particles of common coal, so as to render it slightly turbid. 1. A drop of spirit of wine, or of naphtha, placed as above mentioned, exhibits two, three, or four, vortices or centres of circulation, according to the size of the drop; and if these vortices are viewed laterally, the lines of particles will be seen forming oblique curves from top to bottom of the drop. 2. Oil of turpentine shows a rapid circulation in two continuous spirals, one to the right, the other to the left, around the drop. These meet in the opposite diameter, from which the particles are slowly carried across the diameter to the place of starting; and this continues while there is fluid enough to let it be seen. 3. If, however, the drop does not exceed one-tenth of an inch in diameter, it presents the appearance of particles continually rising up in the middle, and radiating in gentle curves to the circumference. 4. If the liquid be put into a very small vial, similar motions are perceived; the particles, when they have reached the side of the vial, going down, to rise up afterwards in the centre or axis. 5. If a bubble of air be enclosed in the liquid, motions similar to those described in No. 2 are observed in the part immediately in contact with the bubble. 6. In a flat drop of new wine, laid on the tablet, but not compressed by the mica, the motion was a regular uniform circulation; the particles rising from below at one end of the drop, then passing straight across on the surface, and descending at the other end."

ing with a new test for the verification of oils in general, and of olive oil in particular, he did not do so with that kind of finished knowledge which would enable him to put his hand on a particular specimen and say where it was grown, the size of the olives from which it was drawn, and similar particulars which required long practice and experience with a great variety of olive oils. If, for instance, a chemist presented a new mode of determining the per centage of copper in a given ore, and that test were superior both in accuracy and brevity to the existing modes, it would not be fair criticism to turn round and say his test was not worth anything because he had not tried it on all the copper ores in the world. In like manner he offered to them a physical test for determining the purity or state of adulteration of a given oil. It was for gentlemen interested in the subject to try it for themselves. It was no answer to say that these figures did not agree with specimens which persons had tried for themselves: of course they varied. He had laid down the conditions of this test that the resulting figure was a function of the cohesion, the adhesion, and the diffusibility; vary these ever so slightly and the resultant would vary; but he did not think any one could look at the various figures from the various specimens of olive oil without seeing a family resemblance. That was all he claimed. Supposing the specimens furnished to him were commercially pure olive oils, he got a certain figure, and he ventured to say any other commercially pure olive oil all over the world would give, not perhaps identically the same figure, but a figure of the same character, and that they would not mistake the figure given by another oil, such as sessame or poppy, for that of olive oil. In oils of the same name there is that family resemblance which would enable a practised eye to say that is the figure of olive oil, that of sessame, that of poppy, and so on. The gentleman who sent various specimens of oil to him stated he could not answer for their purity, as he did not express the oil himself. As he had stated in his paper, he thought he had got a specimen of pure linseed oil from the press which was working in the International Exhibition, but on looking at the seeds which had been operated upon he found an admixture of from one-fourth to one-fifth of other seeds, so that even in that instance he was baulked in procuring a pure sample. The sum of the objections was simply this—in order to give a standard figure they must define what they meant by their oil. In olive oil there were certain difficulties. There were no less than four distinct kinds of oil obtained from the olive:—An essential oil from the skin, an oil from the kernel, there was the oil from the pulp, and an oil from the stone. As one gentleman had remarked, if the olive had arrived at maturity it was pressed between rollers a certain distance apart, so as carefully to avoid crushing the seeds, and this produced the oil from the pulp only; he believed they got in such a case commercially pure oil, but even that was a complex product. There was in the skin of the olive an essential oil, and it was that, he believed, which produced the hot, peppery taste. If the oil were kept for some weeks, this volatile oil disappeared, and with it the taste also, and they then got an oil which he believed was a fair exponent of olive oil. But supposing the olives were crushed beneath edge rollers, and the stones and kernels were crushed also, then they got all the four oils mixed together. A gentleman had furnished him with oil extracted entirely from the stones of the olive; that produced a different figure as compared with that of sublime olive oil. It was a green viscid oil, different in texture from the oil of the pulp. If they got all the oils mixed together, then they had a composite figure, and they could tell after some practice what were the constituents that made up that figure. With regard to the experiments alluded to by Mr. Varley, they were new to him. He had himself been working in the same direction without knowing that that gentleman had preceded him. He had often observed a similar action, knowing that there was no such thing as inert matter in nature, and he had contrived experiments in which the particles chased each other almost like water-insects chasing their prey. There was one other result he might mention. When a surface of acetic acid was obtained, a single drop of oil of camphor or oil of lavender deposited on that was exactly like a live thing moving about with waving cilia. As he had already stated, his sympathies were with the scientific part of the subject rather than the practical. Another gentleman had referred to a juvenile work of his on "Visible Vibration," experiments which he performed many years ago; but in answer to the question put as to how far vibration affected these figures, he would say that it interfered very much with them. His house was situated within a few hundred yards of a railway, and when experimenting in his private laboratory he was sometimes obliged to wait some minutes till a heavy train had gone by before he could go through an experiment. Certainly repose was necessary for these experiments on cohesion figures, but he hoped they would give him credit for being too old an experimentist to allow his conclusions to be influenced by an accidental source of that kind. A gentleman had spoken of the various species of the olive. Now, the characteristics of the figures would doubtless vary in the case of the wild olive, as compared with the cultivated varieties; but his position was this, that if the oil were olive oil, it must have a certain cohesion, a certain adhesion with reference to water, a certain specific gravity, and a certain molecular condition, whether viscid or fluid, which were all characteristic of olive oil. At present olive oil was commonly recognised by the taste, the colour, or the smell. With regard to his test, it was found that olive oil, whether from wild or cultivated fruit, would always yield a figure distinct from that of other oils. Each oil had a figure of its own, with variation in detail, while there was a general characteristic overruling the whole by which to judge of the oils in question. He begged to thank Mr. Wilson for the testimony he had borne to his experiments. With regard to the difference between the two oleines of beef and mutton, Mr. Hawes had remarked that he saw no resemblance between the two figures, but he (Mr. Tomlinson) thought there were very distinctive features in each case; in the one instance, the drop spread out into a thin film, and then opened into cracks in close contiguity with each other, the cracks radiating towards the centre; in the other instance the cracks were few and far between. It was this resistance in both cases to the force of adhesion that caused the cracks, and constituted the general resemblance between the two figures. He had not mixed those two oleines together, but that was an experiment which any one might perform for himself. He fully agreed with the observations of Mr. Edgar, that the subject was quite new, and that more observation was necessary. He was, however, quite convinced of this, that to get standard figures there must be a careful examination, not only of one olive oil, but of many varieties; the oils of different years, and of different parts of the world, so as to satisfy the eye and the mind of the observer interested in the subject, as to what really was the cohesion figure of olive oil. In reply to what had fallen from another speaker he would say he could not tell by the figures whether the oil would keep good or not, but he could tell this—that if the oil was old and organic changes had set in there would be certain additional phenomena in the developement of the figure in this test. One of those was the production of iridescent rings. Whenever there was an approach to fermentation there was a lighter oil produced, and there was a lighter film formed on the surface, which lighter film overrode the other and produced a succession of rings, a phenomenon that sometimes accompanied some of the fixed oils. In some oils, such as castor and croton oils, these iridescent rings were characteristic phenomena.

Dr. Bachhoffner inquired whether the presence of resinous matter in oils would interfere with the production of the iridescent rings.

Mr. TOMLINSON replied, the presence of resinous matter was indicated by the formation of a net-work. This was the case in oils of the turpentine series. Another gentleman had remarked that the Spanish oil was unfit for eating, and it was quite certain people of refined taste could not tolerate the rancid oil, which was due to the olives being kept in bulk for so long a time that they underwent the process of fermentation. As to whether there was any objection to the use of sessame oil, that was a question he was scarcely competent to answer, but he certainly thought there was great objection to the selling of one oil under the name of another. He had brought this subject forward, thinking it would excite interest and inquiry, but he had no intention of working much at it himself. His object was a scientific one, and having attained that he must leave it to others practically interested in the subject to carry it further; but if gentlemen would send him specimens of what were considered commercially or chemically pure oils, he should have pleasure in communicating the results of his experiments.

The CHAIRMAN said the time had now arrived for him to discharge the pleasing duty of proposing a vote of thanks to Mr. Tomlinson for his very interesting, instructive, and able paper. The subject was one of special interest, not the least of which was its novelty. Mr. Tomlinson had very fairly stated that he had not brought this subject forward as one which had been thoroughly investigated, but he certainly had done well to bring it before a society composed of men eminent both in science and practice, and he was sure the question, introduced in the able manner it had been, would be taken up by those interested in it, and further results might be expected to follow. Mr. Tomlinson, in his reply, had gone so fully into the subject that little was left for him to remark upon. He could corroborate what had been stated with regard to linseed oil. He believed it was next to impossible to get a pure specimen of linseed oil. The detection of this adulteration was an important thing in an article which was so largely used by painters, because unless the linseed oil was good the paint did not harden or dry properly. So far as his own experience with linseed oil went he could fully corroborate what Mr. Tomlinson had stated. There was another branch of the subject to which he (the Chairman) had paid more attention. Mr. Tomlinson recently read a paper before a society with which he (the Chairman) was intimately connected, on the verification of medicinal oils, one of which, castor oil, was subject to a large amount of adulteration. He had been surprised at the results of his experiments, and he had no doubt the matter was capable of being brought to great perfection by means of the tests now introduced. One thing he had found to be very important in conducting these experiments: that was strictly to follow out the directions laid down as to having clean glasses and clean water. He would remark that the best olive oils he had seen were those from the south of France: and he believed the secret of the purity of olive oil was that the olives should not be too ripe, and should be pressed immediately they were gathered. He believed the secret of the excellence of the oil of the south of France to consist in that mode of operation, while the best Spanish oil, as had been already stated, was most unpleasant to the taste, and could not be used in this country for culinary purposes. The reason for the rancidity of that oil was properly stated to be that the olives were allowed to remain in heaps until fermentation was set up, by which a larger quantity of oil was obtained, whilst the quality was deteriorated in a corresponding degree. With regard to sessame oil, Mr. Tomlinson, in his remarks just made, had fully expressed his (the Chairman's) own views. He was not at present prepared to say whether that oil ought or ought not to be used for the purposes for which olive oil was generally employed. It might come to be merely a matter of taste. It was very desirable to have new oils introduced; and if sessame oil were sold as such, and were tasteless and good, he knew no reason why it should not be used. With regard to the tests for olive oil introduced this evening, there was no necessity to make further allusion to them, but reverting to the sessame oil there was a very distinctive test that could be applied to it to detect it from olive oil. If they mixed equal weights of olive oil and of a mixture of nitric and sulphuric acids the result would be the production of a yellow colour, while, if the same mixture of acids were applied to sessame oil, the result would be a bright green colour. That test had been introduced by a French chemist, and he had recently verified it himself. He thought they were much indebted to Mr. Tomlinson for bringing this subject before them. He had very modestly told them it was still in its infancy, but the having brought it before this Society was the proper way to get the matter more thoroughly investigated. He was sure he spoke the feelings of the meeting when he asked them to give a vote of thanks to Mr. Tomlinson for his very interesting paper.

The vote of thanks was then passed.

Proceedings of Institutions.

FAVERSHAM INSTITUTE.—Prizes were recently distributed by S. G. Johnson, Esq., to the successful candidates who had obtained prizes at the local examination. The awards consisted of educational and other works. Mr. Johnson congratulated the manager and committee on the great success which had attended their endeavours to extend the influence of the Institute in a new direction. This was the first time that an examination had been tried, and the result showed the foresight and prudence of the committee in its establishment. The prizes were for arithmetic, English history, writing, English grammar, reading, and geography, and varied in value from £1 to 5s.

HUDDERSFIELD MECHANICS' INSTITUTION.—The annual business meeting of this Institution was held on the 30th January; the attendance was not large. The chair was occupied by Mr. James Dodds. The 23rd annual report congratulated the members on the success of the Institution. During the past year the different branches of education had been maintained in their wonted efficiency, notwithstanding that there had been a decrease in the number of members. The issues from the library show a decrease of 828 volumes. The fortnightly meetings, one of the most interesting features of the institution, had been a great success, and a source of much pleasure and instruction to the members and their friends. The classes, 90 in number, have met five evenings in the week, and have been instructed by a very efficient staff of paid and voluntary teachers. The attendance was in 1862, 1,141; in 1863, 1,164. The drawing classes had been largely attended, and the results bore favourable comparison with those of any previous period. The average monthly attendance had been 368; an increase of 44. The progress made by the bookkeeping class had been very gratifying, and increased accommodation had had to be provided. The attendance at the loom class had been good throughout. Of the singing class the teacher reported that the senior pupils had made considerable progress. A larger number of students had attended the mathematical class than in the preceding year. The French class had increased in numbers, and was in a very efficient state. The slide rule class had passed through a very successful course and had again commenced. The chemical class had recommenced its studies, and was well attended. The Penny Bank again showed an increase in the amount deposited. The financial statement showed that the Institution commenced the year with a balance in hand of £38 17s. 7½d., and concluded it with one of 4s. The annual subscriptions amounted to £289 16s., and the subscriptions of fortnightly members to £315 1s. 6½d.; the total income of the Institute amount-

ing to £738 14s. 1d. In reference to the Penny Bank, it was stated by Mr. J. Brook, when referring to the resignation of the manager, that during the last five years there had been, in connection with it, 85,633 separate cash transactions, involving the exchange of £11,222 7s. 5½d.

Mossley Mechanics' Institute.—The annual tea party and soirée of this institution was held on Saturday evening, the 20th instant. The tea was provided and served by a number of ladies of the neighbourhood, and after tea, George Andrew, Esq., of Apsley House, occupied the chair. The report was read, by which it appeared that the funds of the institution are in a prosperous condition, and that there is a steady increase in the number of the members, which in some degree may be attributed to the reduced charge for membership. The classes in existence are—writing and arithmetic, having 95 pupils, with an average attendance of 63; the English grammar class, comprising 40 scholars, with an average attendance of 30; the vocal music class, having 13 pupils, and an average attendance of 10. There are also classes for the study of geometry and book-keeping, conducted on the mutual improvement principle, with an average attendance of 6. In the library there are 950 volumes, and the issues during the year have been 2,600, being an increase of 747. Since the last tea party there have been seven lectures delivered. The meeting was addressed by the chairman, the Rev. H. Walthew, Dr. John Watts, Rev. E. Merton, Rev. J. P. Hopps, Rev. T. Smith, Rev. Geo. Fox, Mr. R. H. Buckley, Mr. R. S. Buckley, and Mr. Geo. Mitchell, Junior. The speeches were interspersed with songs and quartetts.

Otley Mechanics' Institution.—The annual meeting was held on the 29th January. Mr. Jeremiah Garnett occupied the chair. The report stated that the members now numbered 255, which was a decrease of 67, but this was partially owing to a careful revision of the old list. The receipts for the past year were £114, and the disbursements £106, leaving a balance in the treasurer's hands of about £8. The statement of the Penny Savings Bank was highly satisfactory, and showed that, exclusive of withdrawals, the deposits now exceeded £300. An interesting paper giving the daily readings of the meteorological instruments in connection with the institution, which showed a rain-fall of thirty-one inches, and that the temperature contrasted favourably with other inland towns, was also read.

Potteries Mechanics' Institution.—In the report presented to the annual meeting held at the latter end of January, the general committee states that for the first time during many years the institution was free from debt on account of its funds for working expenses. The income for the past year had been in excess of the expenditure, and had there been no special effort for the liquidation of the debt, the institution would have been in no better pecuniary position than it was a year ago. The number of members at the period of the last general meeting was 431, and at the present time it is 471. In reference to the lectures, the committee had made arrangements for a larger number than usual during the present winter. About one half of these had been already delivered, and while the attendance had not on the whole been commensurate with the excellence of the entertainments, the pecuniary deficit had been but small. Even this trifling loss had, the committee believed, been rather apparent than actual, as they considered that the privilege of attending at reduced rates a series of first-class lectures, &c., was an inducement to persons to join the institution, while in the case of some of the members, it formed almost the only return they received for their subscriptions. The English, French, and chemical classes were going on as usual. The average number of pupils during the half year was: English class, 25; French class, 10; chemical class, 7. The Art Workmen's Guild continued their meetings, which had been attended on an average by eight members. The bagatelle club was still very popular, but the chess club had latterly been inoperative. During the half year fifty-five volumes had been added to the library. Various contributions had been made to the museum. The committee believed that at no period in the history of the institution had its prospects been fairer, or its means of usefulness more efficient.

South Staffordshire Association for the Promotion of Adult Education.—A conference of this association, in connection with the district association of the Church of England Schoolmasters, was held on the 9th of February, at the new Mechanics' Institute, Dudley, under the presidency of Lord Lyttelton. The Rev. H. B. Bowlby, of Oldbury, read a paper on "Night Schools from a Manager's point of view." The peculiar advantages and disadvantages attending night-school work were noticed. With regard to finance the paper urged the desirability of keeping the day and night school accounts together, and as far as possible under the same management and staff of teachers, and supported by the same pecuniary resources. A second paper was by Mr. F. C. Hoton, of Wolverhampton, on "Night Schools from a Teacher's point of view." The paper advocated regular and punctual attendance of teachers and scholars, as without this no lasting success could be expected. He regarded much of the irregularity as owing to the fact that working men were frequently engaged in overtime at night-work. Voluntary teachers should be employed as helps to the regular teachers.—Mr. Talbot proposed a resolution to the effect that it is extremely desirable to have a full and well-digested report of the state of education of the juvenile working population of the district; of the circumstances which tend to hinder or promote the progress of evening school instruction amongst them. He expressed his belief that more should be done in the district in the way of systematic and close inquiry. During the past year he had passed through a phase of most valuable experience in connection with the evening school which he superintended. At the beginning of the year the school was attended by about 100 or 120 boys who were just such boys as were found all through the district voluntarily attending such schools. But in the early part of the last year a change was made; Messrs. Chance ordered an examination of all the boys employed in their glass works, and on the completion of the examination, the Messrs. Chance had brought their influence to bear upon the boys, and had ordered all who were found to be below a certain standard of intellectual attainment in the examination to attend the evening school. The result had been that for some time the former discipline of the school had somewhat suffered, and the difficulty of controlling and teaching the large number that attended had been great; but the plan had upon the whole worked well. This was the sort of thing that was wanted throughout the district.—The general conference commenced at seven o'clock, when Lord Lyttelton again presided. The Chairman briefly opened the discussion of the question, "How the masses of working men in South Staffordshire may be successfully approached in making efforts to improve their social, moral, and intellectual condition.—Mr. Wells, the Chairman of the Bilston Town Commissioners, thought that if the working people could be impressed with a desire to improve their houses, there would be enkindled a desire to obtain better clothes, and they would be more likely to find their way to church on Sunday than to the public-house. Mr. Beard, of Bilston, thought that the elevation of the working classes depended a good deal upon the employers themselves. There were two classes of men connected with the iron works who were very difficult to deal with, and those were the puddlers and the miners. He had found that in Yorkshire, Derbyshire, and other parts of the country, there was less difficulty in this respect. He accounted for this by the fact that, in the latter place, the employers establish large works, and are very careful whom they employ, and will not even take on a puddler unless he can produce a character from his previous master. It is not so in this district. If a man is discharged from a firm one day he knows he can get on at another the

next, and no one asks him why or under what circumstances he left his previous work. Another system which prevailed in this district more than others in connection with mining, is the engagement of the working men by foremen, or middlemen, on whom they are to a certain degree dependent, and there is no direct interest between the employer and the employed. Many of these foremen are owners of beershops, tommyshops, &c., and the impositions and exactions which are put upon the working men by this system is one of the greatest evils of the district. This would not be the case if there was a direct engagement between the employer and the workman; and if the former would look more to the interest of those whom he employs, and take none but those who could produce a character from their previous master, the condition of the working men in this neighbourhood would be very much improved.—Mr. Hague (Bilston) suggested that the payment of wages a little earlier in the week would confer a great boon on the working classes. He read a communication from a large ironmaster, who had tried it in his works and found it to answer admirably, for the wives were able to make their purchases before the articles became a drug in the market, and get home at a reasonable hour on Saturday night, and not on Sunday morning as formerly. The men were able to attend the night school. Many large employers had adopted the movement, and amongst the men and their wives it was highly appreciated.—The Rev. J. H. Iles (Wolverhampton) entered at length on the subject of clubs and institutions by which working men might enjoy that agreeable intercourse which at one time could only be found at a public-house. He suggested the formation of a provident association, founded on the best principles and guaranteed by some of the most influential names in the district of South Staffordshire. He thought such a scheme might be made to work with satisfactory results, for it would check the present evil system of public-house lodges, and offer benefits on a firmer basis.—Mr. Talbot mentioned that such an association was in existence in Birmingham, and was in a very flourishing condition.—Mr. S. Lloyd (of Wednesbury) cordially seconded the proposition of the Rev. J. H. Iles, and entered into the subject of the present evils connected with the engagement of workmen by foremen, &c., instead of by the master, and the entire separation which there is between the employer and the employed. With regard to the early payment he said he had tried it with success for many years, and he found his men liked it much better.—Lord Lyttelton expressed himself in favour of the proposition.—Mr. Yeomans, a puddler, then read a paper showing the practical difficulties in the way of educating adults, and speaking of the good which might result if the men were approached in a kindly Christian manner.—The Hon. and Rev. W. H. Lyttelton advocated the establishment of working men's clubs and penny readings. A vote of thanks to the chairman brought the proceedings to a close.

SOUTH LONDON WORKING CLASSES INDUSTRIAL EXHIBITION.

On Tuesday, the 1st instant, a new exhibition of an interesting character was added to the numerous collections which already exist in the metropolis. The South London Working Classes Industrial Exhibition was formally opened, in the presence of a number of distinguished visitors. The exhibition, the contents of which, as its name indicates, are almost exclusively supplied by working men—is held in a commodious hall at the Lambeth Baths, Westminster-road. The hall, on the occasion of the inaguration, was gaily decorated with flags.

The exhibition has been got up chiefly under the auspices of the Surrey Chapel Southwark Mission, and the Working Men's Committee of the Hawkstone-hall Evening Service, Mr. G. M. Murphy acting as secretary. The hall is filled with articles of every variety, which show the intelligence and the ingenuity of the working men. The objects are stated to be the bringing to light the ingenious contrivances of working men; to show that hours well improved (instead of being spent in idleness, or, worse still, the public-house) may produce results astonishing to the working men themselves; to call attention, if possible, to the patent laws by which many of the useful inventions of poor inventors are to them almost useless, notwithstanding the thought, time, and toil spent in their production; and to give an impetus to the holding of similar exhibitions to the present in different parts of the country. The plan pursued was to go to as little expense as possible, and to try that, whatever the expense, it may be met by the exhibition. The number of exhibitors was stated to be 125, and articles exhibited 500, and these are classified under seven heads. 1. Useful. 2. Ingenious. 3. Ornamental. 4. Scientific. 5 and 6. Artistic and Literary. 7. Curious and Amusing. A catalogue is sold for one penny; the admission is two-pence each person. A memento of the exhibition is to be given to each exhibitor, and prizes to the most meritorious. The exhibition is to be considered in the light of an experiment, which, if successful, will be repeated in subsequent years. It is hoped that the money taken for admissions will repay the expenses. The exhibition was inaugurated under the presidency of the Earl of Shaftesbury, and the meeting was addressed by his lordship, the Rev. S. Newman Hall, Sir Samuel Morton Peto, Bart., M.P., Messrs. J. Bright, M.P., Warner, M.P., S. Morley, Johnson, and Burgess. The exhibition will remain open till Saturday, the 12th of March.

THE METROPOLITAN RAILWAY SCHEMES.

The following is the report of the joint committee of both Houses of Parliament appointed to consider the best method of dealing with the railway schemes proposed to be sanctioned within the limits of the metropolis by bills to be introduced in the present session, and to report their opinion whether any, and, if any, what schemes should not be proceeded with during the present session:—

"Ordered to report that the committee have met, and having jointly considered the matters referred to them, and having taken evidence of such agents and engineers of the several schemes as it appeared to them material to examine, have agreed to the following report, viz.:—

"The railway schemes that have been referred for the consideration of the joint committee, are of extraordinary magnitude for so limited an area as the metropolitan railway district, extending over a length of 174 miles in the aggregate, involving the raising of capital of nearly £33,000,000 in shares, and of £11,000,000 by loan, creating alarm among the holders of a vast amount of property, and interfering, during the construction of the proposed works, with many important public thoroughfares. They include the construction of not less than four new railway bridges across the Thames, two of them of gigantic size, below London Bridge. It is stated by the surveyor to the Commissioners of Sewers for the City of London that the lands and buildings scheduled in the City of London for the proposed railway schemes comprize about one-fourth of the entire area of the City.

"The committee are of opinion that the following bills or parts of bills should not be proceeded with during the present session:—Victoria Station and Thames Embankment, Oxford-street and City, London Main Trunk, Underground Metropolitan Grand Union (the portion south of Thames-street), Charing-cross (Northern), Charing-cross (Western), London Union, Metropolitan District (a portion forming the outer circuit), Tottenham and Farringdon-street.

"The committee recommend that the fees which have been incurred in respect of the said bills be remitted.

"The two first-named of these lines are proposed to be

worked on the pneumatic principle—a principle hitherto untried as applied to railway passenger carriages, and it seems undesirable that the experiment should first be made in an important public thoroughfare. They are passenger railways, and are intended to relieve the streets of omnibus and cab traffic. The necessity for any such lines has been to some extent lessened, supposing the railways forming the inner circuit scheme referred to in a subsequent part of this report be sanctioned.

"The London Main Trunk Underground Railway proposes to provide a more central station for the Great Eastern, an object which is also sought to be accomplished by the Great Eastern itself, by the Great Eastern Metropolitan Station and Railway Bill. The select committee of the House of Lords on metropolitan railway communication of last session recommended that the Great Eastern should be allowed to establish a more central station than it has at present.

"The portion of the Metropolitan Grand Union south of Thames-street, which the committee recommend should not be proceeded with, involves a high-level bridge over the river below London-bridge. The connection between the railways north and south of the river at the east end of the metropolis might, it appears to the committee, be better effected by the East London, through the Thames Tunnel and the proposed abandonment approved by the promoters; and the committee recommend that they should be allowed to amend their estimate, and be permitted to withdraw a portion of their deposit.

"Three schemes on this list, the Charing-cross (Western), the London Union, and the portions of the metropolitan district railways proposed to be postponed, in addition to other objections, require the construction of bridges across the Thames, one of them being a high-level bridge below London-bridge.

"It is further to be observed with reference to these schemes that railway communication between the lines north and south of the Thames already exists on the Westminster side of the metropolis by means of the West London and West London Extension Railways, and another line is in course of construction through the centre of London by the London, Chatham, and Dover Railway, which when completed will unite their south London system with the Metropolitan Railway at the Farringdon-street station, thereby giving them a communication with the Great Northern lines, and thus of necessity connecting the Charing-cross and South-Eastern Railways at Charing-cross with any of the main lines to the north. Therefore the communication, as proposed by any of the last-mentioned schemes, is not urgent.

"The Tottenham and Farringdon-street Railway, by which it is proposed to connect the Cambridge line of the Great Eastern with the station at Farringdon-street, is open to the same objection urged against the Charing-cross (Northern) and the Tottenham and Hampstead (extension to Charing-cross), in that it tends to create a great central station, inasmuch as the Great Northern, the Midland, and the London, Chatham, and Dover Railway, are already brought in direct station communication with the Metropolitan Railway at Farringdon-street. As the Great Eastern Railway has another scheme for an improved station, which the committee recommend should proceed, it appears desirable that this bill should be postponed, at all events until it can be known by experience whether any inconvenient amount of traffic will be concentrated at Farringdon-street by the lines already to meet there.

"The estimated capital required for the construction of the schemes above proposed to be postponed amounts to £18,500,000 in the aggregate, exclusive of what was proposed to be raised by loan for the purpose of the undertaking. The remainder of the sum of estimated expenditure above referred to may be expected to be reduced by the rejection of some of the schemes allowed to proceed.

"Without expressing any opinion as to the merits of the following bills, the committee recommend that they shall be proceeded with in the ordinary course, being only improvements of existing lines or works connecting links of a very limited extent, for enlargement of stations in no way conflicting with any comprehensive system of Metropolitan railways—viz., Great Northern and Victoria Station; London and Blackwall (Extension); London, Brighton and South Coast (new lines in Battersea); Great Northern (No. 1 Barnet Branch); London and North-Western (additional powers); London and South-Western (additional works); North London (additional powers); London, Chatham and Dover (No. 1); London, Chatham, and Dover (No. 2); Great Eastern (Junctions, except Junction No. 8); Midland and St. Pancras Branch; Metropolitan (additional powers).

"The committee also recommend that the Metropolitan and St. John's-wood should be allowed to proceed, as it is a line that passes through a not very populous but increasing district without interfering with much property, and in no way competing with any other scheme. The committee may here remark that it is proposed to be as a single line only.

"The committee also recommend that the Hampstead, Midland, and North-Western and Charing-cross Junction shall be allowed to proceed. This scheme is in some degree open to an objection already referred to, that it tends to create a central station at Charing-cross. It, however, proposes an addition to the railway, which is to be constructed wholly in tunnel, to form three new streets, one of them of a very important character, in continuation of Tottenham-court-road from Oxford-street, in a direct line to St. Martin's-lane, near Aldridge's repository, and from thence to the Thames Embankment, near the Charing-cross Railway station. This new line of thoroughfare, which would be a substitute for the present objectionable road through Seven-dials, and High-street, St. Gile's, would be a great public improvement. The combination of new streets in crowded parts of the metropolis, with the construction of new railways, was recommended in the report of the Lords' committee last session. The committee are of opinion that if the select committee to which the bill for these schemes may be referred should see fit to sanction the scheme they should do so only on condition that the new streets above referred to should be constructed contemporaneously with the railway, and that provision should be made in the bill for ensuring its completion.

"The committee concur in the opinion expressed by the select committee of the House of Lords on metropolitan railway communication of last session, in their third report, that with a view to the distribution of passenger traffic arriving by the main lines of railway coming within the metropolis, and also the relieving the crowded streets by the absorption of a large portion of the omnibus and cab traffic, the completion of the inner circle of railways is desirable.

"It was estimated by the evidence before the committee that great additional accommodation, especially for the labouring classes, is daily becoming more necessary, while there is no prospect of the present ordinary means of conveyance being at all adequate to future wants, and they are of opinion that the following schemes, which contribute towards the formation of such a circuit, may properly be proceeded with—

"Metropolitan District Railways (the portion forming the inner circuit 32, 33, 34, and junctions 7, 8, and 9).

"Metropolitan Railway (Trinity-square Extension).

"Metropolitan Railway (Notting-hill and Brompton Extension).

"Metropolitan Grand Union (portion north of the Thames).

"The committee are also of opinion that the following schemes—viz., the East London, Great Eastern (Metropolitan stations and railways), Great Eastern (Junction No. 8), North London (Kingsland and Tottenham line), Walthamstow, Clapton, and City, may be properly proceeded with; and as these schemes more or less enter

into communication with or compete or conflict in levels with the schemes above referred to, as designed to form the inner circuit, and with each other, the committee are of opinion that all the above schemes may with advantage be grouped together, and be referred to the same select committee.

"In making these recommendations, the committee are of opinion that the greatest accommodation to the public will not be secured by treating the two schemes which pursue almost the same line from Kensington to Brompton to the City merely as competing schemes, one of which is to be preferred to the exclusion of the other. The committee are of opinion that the promoters of these schemes should be recommended to communicate together, and with the surveyors of the City and Metropolitan Board of Works, and devise the most perfect line which their several plans will admit of. By a relaxation of the standing orders such revised plan may be embodied in one bill. The Metropolitan Railway (Trinity-square Extension) and the Western branches of the East London Railway should also be part of the proposed consultation. By such a course much useless expenditure would be saved, and the interests of the metropolis far better secured than by taking the chance of selection of one among the competing lines.

"The committee observe with regret that two of the schemes which they have recommended should be allowed to proceed pass through Finsbury-circus in open cutting. They are, however, informed that the promoters of both are willing to substitute a covered way for the open cutting. In the event of the select committee finding it desirable to adopt either of those lines in preference to those which do not interfere with the circus, the committee recommend that effectual provision shall be made by which the time to elapse between the breaking up of any part of the garden and the completion of the works there and the proper restoration of the enclosure shall be as short as possible.

"Although the committee have recommended that those portions of the metropolitan district railways scheme which are designed to form the outer circle shall not be proceeded with, they concur with the House of Lords' committee of last session in thinking an outer circuit desirable, and they are of opinion that this object might be accomplished by uniting the existing railways on the eastern side of the metropolis with one another, and connecting those of them which are situate on the north side of the Thames with the railways on the south side, making use for this purpose of the Thames Tunnel. For this purpose it would be necessary for the East London to be in connection with the North London, the Great Eastern, and London and Blackwall Railways. This combination, taken in connection with the existing lines on the west and south of the metropolis, as suggested by the secretary of the London and North-Western Railway Company in his evidence before the committee, would complete the outer circuit, but it would be further necessary that mutual facilities to be secured by legislative enactment should be afforded by the several companies for the interchange of traffic.

"In order to give the public the full extent of the system of intercommunication such as that which has been suggested, it would be desirable that the select committee to whom the metropolitan schemes in question may be referred should require that such modifications may be made in the schemes that may be sanctioned as may be necessary for effecting the proposed combination, and also that a clause should be inserted in the bills of all railway companies having termini within the metropolitan district for securing a mutual interchange of facilities for working the traffic upon railways in that district on equitable terms among themselves, and without any undue preference, the terms to be settled in case of difference by the Board of Trade, or an arbitrator to be appointed by that department. A clause should also, they think, be inserted in each of the bills providing that railways having termini within the metropolis shall be subject to the provisions of any act to be passed in the present or any future session for the regulation of railways within the metropolis.

"The committee are of opinion that some of the provisions of the Railway Clauses Consolidation Act, 1845, require provisions in relation to the metropolitan arrangements, and they recommend the introduction of a bill for that purpose. They desire also to direct attention to a suggestion in Colonel Yolland's report to the Board of Trade as to the expediency of requiring all plans for railways within the Metropolitan Railway district to be drawn to the same datum line.

"The committee are of opinion that in the present session such of the bills proposing to sanction railway communication within the limits of the metropolis as are to be proceeded with should commence in the House of Commons."

The report concludes by stating that a map, showing the existing and proposed railways in the metropolis, accompanies the report, and that the committee have directed the minutes of evidence taken before them, together with the appendix, to be reported.

Fine Arts.

Paris Fine Art Exhibition.—Artists who intend to send works to the now annual exhibition, which is to open in Paris on the 1st of May, should remember that they must be sent in between the 10th and 20th of March. In connection with this subject it may be mentioned that exhibitions of works of fine art are expected to be shortly arranged in three of the most important provincial towns of France, of which Rheims, it is understood, is one. The matter is not yet definitely settled, but is expected to be so very soon.

Carbon Photographs.—At the last meeting of the Photographic Society of London some carbon prints, by Mr. Swan, of Newcastle, were exhibited, which gave greater promise than anything hitherto done in this direction. The description of the process by which they are produced will form the subject of a paper, to be read at the next meeting of the Photographic Society, in April.

Manufactures.

Solid Metal Tubing.—A new machine for drawing solid metal tubes has lately been tested in London with considerable success. The system was originally introduced into England by a French gentleman, about ten years ago, but in consequence of defective mechanical arrangements was at that time unsuccessful. The Stephenson Tube Company have lately erected extensive works at Birmingham for the manufacture of brass and copper tubes on this principle, but the new machine is especially adapted to the formation of tubes of steel, and other hard and close-grained metals. The ordinary method of forming wrought iron tubes is by bending round a long narrow plate of the metal so that the edges meet, and then having reduced them to a welding heat, to join them together by drawing the tube through a die made for that purpose. The machine in question entirely differs from this, and its action may be described as follows:—It consists of two large cast-iron cylinders, 11 feet long, placed opposite each other, and connected by a ram of 10 feet travel, which is driven out of the one and into the other alternately. On each end of the cylinders is a massive flange, pierced with eight holes, some four inches across; on the ram is a similar flange, but double, offering eight holes to each cylinder. The diameter of this hydraulic ram is 16½ inches, and the force obtainable upwards of 600 tons. A draw-plate or die of peculiar form is placed in one of the holes in an inner flange of one

of the cylinders, and the tube to be drawn slightly tapered at the end, to allow of its passing into the die, is placed therein, having previously received a steel-headed mandril, intended to act on the interior of the tube. The tube is fixed on the flange of the ram by means of a screw pin projecting through the flange of the cylinder, and the stem of the mandril is fastened to the further end of the cylinder. The water being forced into the cylinder the ram is driven forward, and the tube is drawn bodily through the die, or draw-plate, and over the mandril, the head of which, inside the tube, is placed within the circle of contact of the die outside. By this means the tube is drawn externally and internally at the same time, and an eighth of an inch of steel may, at a time, be displaced from the surface, the tube being elongated proportionately; but in practice it is found more convenient to take off less at each pass in order to avoid fatiguing the metal overmuch. It is stated that two bars of rough iron, as delivered from the forge, $3\frac{1}{2}$ inches diameter and 4 feet long, were placed in the machine and drawn through the die, the drawing occupying some five minutes. The bars issued from the die with a surface finer than can be obtained at present by any known mechanical means, except continued friction, and infinitely truer than any turning-lathe produces. It would take a man at a lathe two days at least to turn these bars, and he would then produce inferior results to those obtained in perhaps a quarter of an hour, if the time employed to fix and unfix the bars in the hydraulic drawing bench be included. It will scarcely be necessary to remark, in conclusion, that should this machine fulfil the expectations of the inventor it will cause a complete revolution in the manufacture of gun-barrels, hollow shafting, axles, piston rods, and such-like articles.

Band Saws.—A correspondent asks how it is that these saws are not manufactured of good quality in this country, and why the only band saws that are found to stand are made and imported from France? Why is Sheffield beaten in her own walk?

Nature Printing from Steel.—Mr. H. C. Sorby, F.R.S., whose researches into the microscopic character of the internal structure of steel are well known, has brought out an ingenious method of showing this structure, by making the steel become, as it were, its own block for printing on paper its peculiar characteristics; in fact, a species of nature printing. When iron is converted into steel by cementation, three distinct crystalline compounds are formed, two of which are readily dissolved by diluted nitric acid, whereas one is scarcely at all affected by it. If, therefore, a piece of steel be ground flat and polished, and then placed in the acid, after a suitable amount of action this constituent retains its original surface and polish, whereas the other two are so much dissolved that it stands up in sufficient relief to allow of the block being used for surface printing instead of a wood cut, so as to exhibit the structure of different varieties of steel, and such is Mr. Sorby's ingenious process. Printed illustrations of the process were exhibited by Mr. Sorby at the conversazione which lately took place at Sheffield, under the auspices of the Leeds Literary and Philosophical Society. These consisted of a "square bar of iron once converted, transverse section, showing iron remaining in the centre;" a "flat bar of iron, slightly converted, the crystals being small;" a "square bar of iron, twice converted, transverse section, showing the centre incompletely converted;" a "flat bar of iron, highly converted, the crystals being rather large;" a "round bar of 'homogeneous metal,' converted, transverse section;" and a "flat bar of hammered cast steel, re-converted, the crystals very large." Mr. Sorby has sent specimens to the Society of Arts.

Commerce.

The Silk Trade in France.—"The silk trade," says the *Courrier de Saint-Etienne*, "appears to be now undergoing a general crisis, the end of which it is difficult to foresee. The American conflict was almost sufficient to shake confidence at Lyons, and the events in Germany have increased the disaster. Unfavourable advices are being received from the neighbourhood of Aubenas, and a large number of silk-dressers have determined to close their mills, in consequence of the impossibility of striving any longer against a disastrous situation. The statement of the general trade in silk for the year 1863 gives a total of 5,647,750 pounds against 6,098,148 pounds in 1862. The effects of this situation are naturally felt at Saint-Etienne. Our ribbon manufacturers are indeed producing a few plain and fancy articles, but orders are scarce. As to velvets, they are passing through a crisis which prejudices our interests in a serious manner."

The Geneva Watchmaking Trade.—The *Builder* says that this trade has been much disturbed of late years, and is still depressed. The number of watches made at Geneva has always been over-stated; many of the watches made at Neuchâtel and other parts of Switzerland, where are produced enormous numbers, being attributed to Geneva. In 1858 political events paralysed the trade. In 1851, the Great Exhibition year, it revived, and it is calculated that about 65,000 watches were made in the twelve months—a number which may be taken as the annual average of Geneva's best time. In 1860 the number turned out was about 40,000, and in 1861, 10,000 less. There is a law in Geneva which prevents the sale of a watch whereof the gold is not of a certain high degree of purity, and this of course gives an advantage to the less scrupulous makers in other parts of Switzerland in markets where inferiority is not discovered; but it is thought that in the end the guarantee which the law in question thus affords the purchaser of a genuine Geneva watch, will bring back buyers and restore prosperity to the trade.

Surat Cotton.—Messrs. H. Clason & Co.'s Market Report, dated Bombay, 12th January, says:—"The prospects continue highly favourable, and most estimates of the shipments from the ports of India for 1864 are 1,600,000 bales. The crop of 1862, which was shipped in 1863, did not exceed that of the previous year, because of the entire failure of the crops in several districts, and the additional soil put under cotton cultivation only just sufficed to make up for the deficiency thereby created. However, it is not to the old cotton district that we have to look for largely increased supplies—their powers of production have already been pretty well taxed—but to new lands, or such parts as have hitherto grown other crops. Amongst the latter the district of Sind is likely to take a prominent rank. The crop in this district is generally put down at about 300,000 bales, which is more than double the previous year's yield. Although bright and clean, there is, however, no improvement whatever in the real value of the cotton, the staple remaining so short and curly that it must be next to impossible for mill-owners to use it. This kind of cotton not being appreciated in Europe, there is only a small proportion of it shipped direct; it is mostly purchased at Kurrachee by the natives, and sent to Bombay, and here large quantities of it are employed for mixing with better descriptions of cotton, thereby reducing the price of the latter. This short-sighted and fraudulent practice is carried on openly and by many native merchants, who are considered first among their class, and it cannot but react unfavourably on the trade of Bombay."

Colonies.

The Revenue of New South Wales, for the quarter ending 30th September, 1863 was £397,923 13s. 9d., showing a decrease of £33,719 19s. 10d. as compared with the corresponding quarter in 1862.

Queensland Cotton.—The *Young Australian*, which sailed from Brisbane on the 15th December, had on board 57 bales of clean cotton, weighing 17,100 lbs.

Limestone in Queensland.—It is said that a very valuable limestone quarry has been opened near the river bank, three or four miles above Rockhampton, possessing all the properties of the lias limestone found at Cardiff. It is also reported that marble of a very superior description is known to exist in the same locality.

Exports from South Australia.—The exports of colonial produce, for the quarter ending 30th September, are valued at £299,016. The chief items are breadstuffs and copper, the wool shipments of the season not being included in the September returns.

Western Australia.—The news from Nicol Bay and the De Grey are satisfactory. A correspondent from the De Grey states that he can immediately find pasture for 20,000 sheep within a radius of 20 miles from his station, and so rapid is the growth of grass, that in five days the spring of feed from freshly burnt ground was sufficient to afford his sheep a bite. Specimens of hay made from the natural grass have been pronounced excellent, and there is no doubt that if brought to Freemantle it would sell at a profit above the cost, labour, and freight. The spinifix grass which was lately considered all but useless, is preferred by the sheep of Mr. Harding to the other grasses, especially the young spinifix springing from burnt ground. The Aborigines have continued friendly, but the guns of the party and their watch-dogs seem to have a material influence upon the native mind. Mr. Taylor, on his return to Perth, reports that he had proceeded up the De Grey to within a few miles of the Oakover. There was plenty of feed and water, but no high land fitted for a station.

Supply of Labour in Western Australia.—A Perth paper says:—"By the arrival of the *Tartar*, after a passage of 107 days, we have received a welcome addition of free labour, and especially of domestic servants. That vessel brought 129 Government immigrants, including 33 single women, but labour is still wanted for public works. The road at the foot of Mount Eliza, or Bazaar-terrace, having been partially formed, appears to have been abandoned, and all the available labour employed upon an imperial work, the Pensioner Barrack. A large party is now employed making bricks for that structure, and how long it will be before labour will be available for colonial works it is difficult to say."

The Glenelg Settlement.—The time of departure of the Victoria pioneers has been postponed until April, but Sir George Grey, the original explorer of this district, has expressed his belief that, independent of its undoubted character in other respects, it possesses mineral resources of value. He enumerates gold, copper, and lead.

The Gold Fields, New South Wales.—In the southern districts the success of the miners has not been very encouraging. The Kiandra diggings now exist only in name; the severity of last winter drove away many of the miners; local jealousies and official mismanagement have finished the work of depopulation. In the western and northern districts the miners have met with varying success; on the whole the yield of gold has been a full average. The Old Ophir diggings have been again brought into note by some very good finds. In one claim twenty-five ounces of gold were washed from a bucketful of dirt from the gutter. At Hargreaves some new reefs have been opened; from a block of stone thirty-six ounces of gold were picked. The quantity of gold dust delivered by the escorts during the month of September last from the several gold-fields has amounted to 33,288 ounces; in September, 1862, the receipts reached 44,803 ounces. For the first nine months of 1862 the quantity was 483,313 ounces; during the same period of 1863 the receipts have been only 327,209 ounces, which is a decrease of 33 per cent. The falling off may be traced to the small amount now received from the Lachlan and Burrangong fields, but from some of the minor gold-fields there is a steady increase.

Finance in New South Wales.—The Colonial Treasurer, in his recent financial statement, estimated the deficit at the end of last year at £534,539, which, however, might be reduced £100,000 from savings. The proposed expenditure for the service of the year 1864 amounted as per estimate to £1,926,457, and the amount of expenditure to be covered by loan was £451,127; total £2,912,123. On the credit side the estimated revenue for 1864 was £1,556,130, and the amount to be raised by loan was £451,127, leaving a balance deficiency at the end of the year 1864 of £904,866 8s. 6d. His scheme of taxation to meet this large deficiency was as follows:—first, stamp duties, estimated at £55,000; secondly, an equalisation of duty on spirits to 10s. per gallon, which would bring in £60,000, and an increase on the duty on wine to 3s. per gallon, £20,000. He also proposed *ad valorem* duties ranging from 5 to 10 per cent. on all articles except the following:—animals (living), passengers' baggage, printed books, coin and bullion, cotton (raw), flax, hemp and fibre, flour, meal, and bread, gold in its natural state, grain of all kinds, guano and manures, hides and skins, dried and salted military and naval stores, ores (unsmelted), plants, trees and shrub roots (esculent), salt, specimens of natural history, tallow, and wool. This scheme of taxation caused much opposition in the mercantile and trading community, but after some articles had been added to the free list, and others reduced from 10 to 5 per cent., the premier (Mr. Martin) subsequently announced the intention of the government to abandon the *ad valorem* duties, and in their place specified rates on particular articles have been proposed, the duties to be levied upon some articles by weight, and upon others by a charge upon packages. The amended tariff is said to be almost as much objected to as the first, as in some instances the duties are heavier and they operate very unfairly. The equalisation of the spirit duties is also thought likely to encourage illicit distillation.

Obituary.

C. F. Bielefeld was born in February, 1803, and when quite a boy turned his attention to modelling. He was self-taught, and at the age of eighteen he obtained a medal, which was presented to him by the Duke of Sussex, for modelling a bust from life. He continued to follow the art for a short time, but circumstances caused him to enter into commercial life, and he always regretted that he did not follow the profession of a modeller or sculptor. He was the first to introduce papier mâché, as manufactured by him, and applied to architectural decorations, &c. By great perseverance he gradually got together a few patterns, all of his own modelling, and he moulded, cast in metal, and chased with his own hands a large number of valuable metal dies for manufacturing papier mâché for architectural and other decorations. The dies in his possession at the time of his decease amounted to some hundreds, and weighed about fifty tons. They are composed of brass, lead, iron, and mixed metal. He took out several patents for articles connected with architectural and other decorations. His patent slab was used, under the direction of Mr. Sydney Smirke, for the lining of the large dome of the new reading-room of the British Museum. In 1832 he modelled and executed in papier mâché the decorations of the Pantheon in Oxford-street, Grocers' Hall, &c. He died on the 10th of January last.

Publications Issued.

Buckmaster's Elements of Mechanical Physics. (*Chapman and Hall.*)—This little book is intended for instructing an intelligent, but not highly-educated mind in the rudiments of physics, and professes to enumerate, with clearness and simplicity, the primary bases on which to build the knowledge required by a mechanic, in enabling him to pursue his craft. The

mathematics of the book are not very high, but the author had evidently no wish to enter deeply into his subject. In teaching artisans, one of the greatest errors would be to complicate a subject, and the one great step to be attained, especially in physics, is to establish a simple outline bearing on those points with which a workman has most to deal. Mr. Buckmaster's work is intended as a guide for such elementary education.

The Statesman's Year-Book; a Statistical, Genealogical, and Historical Account of the States and Sovereigns of the Civilised World, for the Year 1864. By Frederick Martin. (*Macmillan and Co.*)—The information about each of the 78 States is divided into a series of heads, which are repeated with regularity in each particular case, and statistics which were previously widely scattered are here brought together and tabulated in a convenient form. The facts concerning reigning sovereigns are arranged in such a manner that the dynastical relations which play so important a part in modern history may be easily seen. Notices of the origin and history of the reigning houses are given, with lists of the successive sovereigns. Under the head of "Constitution and Government" a division appears, in which a sketch is given of the constitutional organisation of the different states, and the prescribed action of the legislative and executive authorities. For every State a list is given of the chief officers in the executive departments, including the presidents and vice-presidents of Republics. The most important features of representative forms of Government are explained. "Church and Education" are treated briefly in the more important States. "Revenue and Expenditure" are fully given. The increase and decrease of the national income and expenditure are exhibited, together with the sources of revenue and the objects for which it is applied; and the origin, growth, and actual state of the public debt of the various countries are appended. Under the head of "Army and Navy," there is an account of the aggressive and defensive powers of the States. Under the head of "Population," are included notices regarding the increase of population, the division of the soil, the occupation of the people, criminal returns, and similar matters; and, under the head of "Trade and Commerce," detailed accounts are furnished of the imports and exports and the shipping of all the States in the world, with particular regard to the commerce of this country. The manufacturing industry of the chief nations is given in its principal outlines, together with their mineral wealth.

Manual of the Metalloids. By James Apjohn, M.D., F.R.S., Professor of Chemistry in the University of Dublin. With 38 Woodcuts. (*Longman and Co.*) This is the third of a new series of manuals of the Experimental and Natural Sciences, edited by the Rev. J. A. Galbraith, M.A., and the Rev. S. Haughton, M.D. In a preliminary chapter the laws of combination are laid down, and applied to the construction of a table of equivalent numbers. The atomic theory is here brought under discussion, and the hypotheses pointed out through which equivalent numbers may also be viewed as atomic weights. Chemical symbols and notation are next explained, after which the subject of atomic volume is taken up. A succinct account is next given of the doctrine of isomeric and isomorphous bodies, and of the method by which the formula of a compound may be deduced from the results of its analysis. Attention is directed to elective affinity, in connection with which subject the views of Berthollet are considered and explained. The elements which constitute the Metalloid group are then taken up in succession, beginning with oxygen; and here the descriptive portion of the volume commences. Throughout this the method adopted is to begin with an account of the processes by which each element may be insulated, and then to give in detail its leading properties and reactions, together with the economic and other applications of which it may be susceptible. The compounds formed by each element with those which precede it are next examined, and to many of these a considerable development is given in consequence of their being judged interesting to such as are engaged in some branch of manufacture, or in the study of medicine or engineering. The volume closes with an account of the analysis of gases by eudiometric combustion.

Notes.

Prize History of Germany.—The quinquennial prize of 1,000 thalers in gold, founded in 1844, for the best work on the history of Germany, has been this year recently awarded to Mons. Haeusser for his history of that country since the death of Frederick the Great.

Coffee as a Disinfectant.—This berry has long been known as a disinfecting agent, but the two following experiments illustrate a mode of using it not generally adopted:—A quantity of meat was hung up in a room which was kept closed until the state of decomposition of the meat was far advanced. A chafing dish was then put in, and 500 grammes of half-roasted coffee thrown on the fire. In a few minutes the room was disinfected. In another room sulphuretted hydrogen and ammonia were developed, and 90 grammes of coffee destroyed the smell in about half a minute. The best way to effect this fumigation is to pound the coffee in a mortar, and then strew it on a hot iron plate.

Alexandra Park.—Messrs. Kelk and Lucas, the contractors, are getting on steadily with the removal of the Exhibition building to Alexandra-park, where the works are making satisfactory progress. A cricket-ground is being laid out, and will be ready for play early in June. Two Swiss pavilions are ordered for the players, and another pavilion will be erected close to the Wood green station with a view to the accommodation of 8,000 or 10,000 people. A gymnasium is also contemplated; but the central attraction of the park will be the new building, to be erected at once. Of this building a chromo-lithograph has been issued by Messrs. Day and Son with the sanction of the company. The building will be 900 feet long and 85 wide; one transept of 430 feet will cut the nave in the middle, and each half will be again bisected by a shorter transept of 320 feet, all the transepts being the same width as the nave. Over the centre of the building will be one of the Exhibition domes, but this will be covered in all round except at the top. Two octagonal cupolas will surmount the junctions of the nave and the shorter transepts. The terraces will be laid out on a most extensive scale. That on the north-western side will measure 1,000 by 160 feet, and under it will be formed a railway station, to which passengers may ultimately be brought from all parts of London. A concert-room, a theatre, a grand orchestral platform, a number of dining and refreshment rooms, picture galleries, reading-rooms, &c., are all contemplated.

French Scientific Expedition to Mexico.—The Imperial Government has issued a commission—the members of which include the Ministers of Public Instruction and of Fine Arts; Baron Gros, formerly Minister Plenipotentiary in Mexico; M. Michel Chevalier, Senator; Admiral De la Gravière, who commanded the French naval expedition to Mexico; Messieurs Maury, Milne-Edwards, Quatrefages, Sainte-Claire-Deville, and other members of the Institute of France; Baron Larrey, Physician-in-Chief of the French Army; M. Violet-le-Duc and Cesar Daly, architects—to prepare the organisation of a scientific expedition to Mexico and to follow out its results, and a credit of 200,000 francs is to be opened to meet the costs of the undertaking. The report of the Minister of Public Instruction commences with a reference to the famous cohort of Savans that accompanied Napoleon to Egypt—to the "Institut de Cairo"—the "Description of Egypt"—and to the discoveries of Champollion, who, says the Minister, could neither have conceived

nor carried out his interpretation of the hieroglyphics but for the great work just named—to the discoveries and consequent labours of Geoffroy Saint-Hilaire and his companions; and says that the Emperor, inspired by these souvenirs, has willed that what Napoleon I. did for the banks of the Nile should be accomplished in Mexico under the auspices of Napoleon III. The scheme is a grand one, comprehending science in a wide acceptation of the word, and including geography, geology, botany, natural history, anthropology, and archæology, in short all that refers to the history of nature and of man, in the once famous dominions of Montezuma. The duties of the Commission are given as follows:—"To furnish the explorers with necessary instructions, to follow the progress of the expedition, and to prepare, for the learned world, the publication of a work which shall be a worthy monument of such an enterprise." Mexico, as the report says, does not possess the historical interest that hangs around Egypt and the East, but certainly there is no part of the world, at the present day, at once so little known and so full of interest, and the expedition, if conducted with common ability, cannot fail of a rich harvest.

College of Preceptors.—It appears by the report of the Council that the affairs of this Corporation are in a most prosperous and promising condition. Forty-four new members have been elected since June, and the diploma of licentiate has been granted to five gentlemen, and that of associate to three. The pupils' examination has been thrown open to schools in general, and at Christmas 530 pupils were examined. The movement in behalf of scholastic registration is rapidly advancing, and appears to be generally supported. The Council trusts that before long such practical steps may have been taken as will render it possible to submit to the legislature a measure containing provisions identical in the main with those which have already received the sanction of the profession, and which are imperatively required, not less for the protection of the public than for that of competent educators of all classes and denominations. It is worthy of remark that mere membership of the College is not considered by the Council to be any guarantee whatever of attainment, or of ability to instruct, as is stated by the president, the Rev. B. H. Kennedy, D.D.—"It is important that the only titles which imply either examination, or any recognition on the part of the College, of ascertained professional competency, are fellow, licentiate, and associate." The object of admitting persons as members, without compelling them to undergo examination, is to give all *bonâ fide* and respectable educators the opportunity of co-operating with their brethren in the effort to "advance the cause of education, or the interests of the scholastic profession," in accordance with the powers granted to the College by its Royal Charter.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered during the Vacation, 1863.

Royal Academy Commission—Appendix and Index to Report, &c.
Census of Ireland (1861). Vol IV., Part I. (Area, Population, &c.) (No. IV.) (County of Roscommon).
" " (No. IV.) (County of Sligo, &c.).
" Vol. I., Part III. (Vital Statistics).
" Vol. IV., Part I. (Area, Population. &c.) (No. I.) (County and town of Galway).
Colonial Possessions—Reports (North American Colonies) Part II.
Colonial and other Possessions of the United Kingdom—Statistical Tables, Part VIII.
Trade and Navigation of the United Kingdom (1862)—Annual Statement.
British North America (Exploration)—Captain Palliser's Journals, &c., &c.

Session 1862.

307 (B I.) Poor Rates and Pauperism—Return (B).
485. Poor Law Unions—Return.
307 (C I.) Poor Rates and Pauperism—Return (C).
307 (E.) " " Return (E).
488. Sessional Printed Papers—Numerical List and Index.

Delivered on 5th February, 1864.

Affairs in Japan—Correspondence.

Session 1863.

431 (A VIII.) Poor Rates and Pauperism—Return (A).
Census of England and Wales, Vol. III.—General Report.

Delivered on 6th and 8th February, 1864.

19. Railway and Canal, &c. Bills—General Report of the Board of Trade.
France—Correspondence respecting the proposed Congress to be held at Paris.
Italy—Treaty of Commerce and Navigation.
Tunis—Convention relative to the holding of Real Property by British Subjects.
Ionian Islands—Treaty.
515. Poor Relief (Lancashire, &c.)—Return.

Delivered on 9th February, 1864.

15. Bastard Children—Return.
18. Vaccination—Return.
Greece (Accession of Prince William of Denmark to the Throne)—Treaty.
Poland—Correspondence.
Belgium (Redemption of the Scheldt Toll)—Treaty and Convention.
China (Mr. Lay's Memorandum)—Correspondence.
Education—Revised Code of Regulations.
North America (No. 1) (The "Alabama")—Correspondence.

Delivered on 10th and 11th February, 1864.

7. Sardinian Loan—Account.
24. General Committee of Elections—Mr. Speaker's Warrant.
1. Public Income and Expenditure—Account.
4. Licences (Wine and Beer, &c.)—Return.
5. Greek Loan—Account.
6. Russian Dutch Loan—Account.
26. Police (Counties and Boroughs)—Reports of Inspectors.
1. Bills—Rents (Ireland).
3. " Judgments, &c., Law Amendment.
4. " Insane Prisoners Act Amendment.
6. " Malt for Cattle.
7. " Collection of Taxes.
Denmark and Germany (No. 1)—Correspondence respecting the Maintenance of the Integrity of the Danish Monarchy.
Poor Relief (Scotland)—Eighteenth Report of the Board of Supervision.
Metropolitan Railway Schemes (1864)—Board of Trade Report.

Delivered on 12th February, 1864.

17. Chelsea Hospital—Return.
23. East India (Council)—Return.
9. Bills—Chain Cables and Anchors.
10. " Sir John Lawrence's Salary.

Session 1863.

528. Property and Income-tax (Special Commissioners)—Returns.

Delivered on 13th and 15th February, 1864.

37. George Victor Townley—Correspondence, &c.
47. Navy Estimates.
5. Bills—Conveyancers, &c. (Ireland).
11. " Government Annuities.
Irish Fisheries—Report of the Special Commissioners.
Metropolitan Railways—Colonel Yolland's Report.
37. George Victor Townley—Corrected Pages of Correspondence.

Delivered on 16th February, 1864.

50. Army Estimates.
28. Army Estimates—Explanations, &c.
2. Bills—Landed Property Improvement (Ireland) Act Amendment.
8. " Church Rates Commutation.
13. " Trespass (Ireland).
14. " Appeal in Criminal Cases Act Amendment.
15. " Vestry Cess Abolition (Ireland).
16. " Bank Acts (Scotland).
18. " Tests Abolition (Oxford).

Delivered on 17th February, 1864.

48. Navy (Ships)—Return.
12. Bill—County Courts (Ireland).
Indian Officers' Memorials—Report of the Commission.

Delivered on 18th February, 1864.

19. Railway and Canal, &c., Bills—Board of Trade Reports.
30. Manufacturing Districts Act (1863)—Report by R. Rawlinson. Esq.
55. Railway and Canal Bills Committee—First Report.
61. Penal Servitude—Copy of Correspondence.
19. Bills—Warehousing of British Spirits.
21. " Forfeiture of Lands and Goods.
22. " Watching of Towns (Ireland).

Delivered on 19th February, 1864.

16. Flogging (Army and Militia)—Return.
21. Flogging (Navy)—Return.
29. Mint—Account.
33. Public Income and Expenditure (1861-62 and 1862-63)—Account.
38. East India (Civil Service)—Regulations.

41. Queen Anne's Bounty—Account.
46. Navy (1862-63)—Statement of Savings and Deficiencies.
62. Committee of Selection—First Report.
19. Railway and Canal, &c., Bills (1. Charing-cross Railway; 2. Charing-cross (Northern) Railway; 3. Charing-cross (Western) Railway; 4. East London Railway; 5. Great Eastern Railway (Junctions); 6. Great Eastern Railway (Metropolitan Station, &c.); 7. Great Northern and Victoria Station Railway; 8. Great Northern Railway (No. 1) (Barnet Branch, &c.); 9. Hampstead, Midland, North Western, and Charing-cross Junction Railway; 10. London and Blackwall Railway; 11. London and North Western Railway (Additional Powers); 12. London and South Western Railway (Additional Powers)—Board of Trade Reports.

Delivered on 20th and 22nd February, 1864.

32. Clerical Subscription—Copy of the Commission.
40. Charitable Funds—Return.
60. Cotton Manufacturing Districts—Reports by H. B. Farnall, Esq.
67. Navy (Steam and Sailing Ships)—Return.
49. Navy (Labour Charts)—Return.

MEETINGS FOR THE ENSUING WEEK.

MON. ...Entomological, 7.
Medical. General Meeting at 7; at 8½, Dr. W. Tilbury Fox, "On the Classification of Skin Diseases."
Asiatic, 3.
Royal Inst. 2. General Monthly Meeting.
R. Academy, 8. Mr. R. Westmacott, R.A., "On Sculpture."

TUES. ...Medical. Anniversary at Willis's Rooms. Oration by Dr. Thudichum at 5. Dinner at 6½.
Civil Engineers, 8. Continued discussion upon Mr. Sopwith's paper, "On the Mont Cenis Tunnel." And, time permitting, Mr. G. H. Phipps, "On the Resistance of Bodies passing through Water."
Med. and Chirurgical, 8½.
Zoological, 9.
Syro-Egyptian, 7½. Dr. John Irwine Whitty, C.E., "The Water Supply of Jerusalem, ancient and modern."
Ethnological, 8. 1. Mr. John Lubbock, "On Ancient British Tumali." 2. Mr. Thos. J. Hutchinson, "On certain Native Tribes of Brazil and Bolivia."
Royal Inst., 3. Prof. Marshall, "On Animal Life."

WED. ...Society of Arts, 8. Mr. Frank Buckland, M,A., "The Science of Fish-hatching."
Geological, 8. 1. Mr. E. Ray Lankester, "On the Discovery of the Scales of *Pteraspis*, with some remarks on the Cephalic Shield of that Fish." Communicated by Prof. T. H. Huxley. 2. Mr. G. E. Roberts, "On some Remains of *Bothriolepis* from the Upper Devonian Sandstones of Elgin." Communicated by Prof. J. Morris. 3. Dr. J. J. Bigsby, "On Missing Sedimentary Formations from Suspension or Removal of Deposits."
Graphic, 8.
Literary Fund, 2. Annual Meeting.
Archæological Assoc., 8½. 1. Mr. Cuming, "On Archers' Badges." 2. Various Exhibitions of Roman, Saxon, and Mediæval Antiquities, by Mr. Taylor, Mr. Irvine, and Mr. Brent." 3. Mr. Planché, "On an Effigy of one of the Markenfield Family in Ripon Cathedral."

THUR. ...Royal, 8½.
Antiquaries, 8.
R. Society Club, 6.
Royal Inst., 3. Prof. Marshall, "On Animal Life."

FRI.......Astronomical, 8.
Royal Inst., 8. Rev. W. H. Brookfield, "On the Use of Books."

SAT.......R. Botanic, 3¾.
Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

Patents.

From Commissioners of Patents Journal, February 26th.

GRANTS OF PROVISIONAL PROTECTION.

Additions and multiplications, apparatus for making—243—H. A. Bonneville.
Aerostation, apparatus for facilitating—298—G. Davies.
Agricultural implements—413—R. Hornsby, J. Bonnall, and W. Astbury.
Air, apparatus for inhaling—340—W. Clark.
Armour-plates, fastenings for—411—C. P. Coles.
Atmospheric pressure, propulsion by—310—Sir J. S. Lillie.
Barley, &c., apparatus for screening—344—T. S. Cressey.
Barometers—373—J. Hicks.
Blocks, &c., for printing—294—G. H. Holloway.
Bone, horn, &c., softening or dissolving—403—J. Wadsworth.
Bread, &c., manufacture of—393—S. Darby.
Brewing, &c., mashing process—235—J. Fry.
Cast wheels, manufacture of—328—N. McHaffie.
Cement, &c., manufacture of—339—J. Toussaint.
Coke ovens—338—W. C. Stobart.
Cotton, &c., machinery for combing—365—I. Dimock.
Cotton, flax, &c., apparatus for combing—336—J. Smith.
Cowls for chimnies, &c.—389—G. Bohn.
Crinolines—3078—J. Fleurman.
Cylinders, steam engine—326—T. Snowdon.
Doors, &c., rendering water-tight—285—J. Smith.
Earthenware, &c., saddles for supporting—296—I. Edwards.
Engines, &c., deadening the noise produced by—352—S. Middleton.
Ether, methylic—387—P. A. L. de Fontainemoreau.
Fabrics, looped, &c.—350—W. Carnelly.
Felting, wool and hair—2697—H. B. Barlow.
Fire-arms, &c., construction of—409—J. Aisthorpe.
Fire-arms, breech-loading—3253—W. E. Newton.
Fire arms, breech and muzzle-loading—397—R. St. L. Pigot.
Fire-guards—311—H. Gurney.
Furniture—375—F. W. Burton.
Gaseliers, slide for—300—S. Bark and T. Attwood.
Hinges—312—M. Runkel.
Lace, imitation—279—S. Ferguson, jun.
Liquids, apparatus for measuring, &c.—359—J. H. Johnson.
Locks, &c.—379—J. Redford.
Metals, &c., machines for punching, &c.—383—W. Krutzsch.
Mill straps, &c.—306—J. Lee.
Paints, &c., preparation of—332—J. Webster.
Power, machinery for transmitting—377—T. Smith and T. Lister.
Power, obtaining and transmitting—348—A. V. Newton.
Printing rollers—391—J. Huntingdon.
Pullies, &c.—367—J. W. Wetherell.
Railway rails—369—J. Henderson, S. C. Child, and W. L. Duncan.
Reaping machines, &c.—327—D. Pidgeon and W. Manwaring.
Rooms, &c., warming—342—A. M. Perkins.
Sewing, &c., machinery for—334—V. De Stains and T. Rogers.
Sewing machines—302—M. A. F. Mennons.
Sewing machines—304—J. Cooper.
Ships' cables—3144—R. Saunders.
Stays, &c.—245—S. Dixon and J. Calvert.
Steam, &c., application of, to circular motion—381—G. Finch.
Steam boilers, &c., securing tubes in—347—A. V. Newton.
Steam boilers, &c., vertical—324—J. T. Oakley.
Sulpho-cyanides, manufacture of—346—P. Spence.
Swings, cradles, &c., oscillating motion in—401—J. Deavin, M. Deavin, and J. H. Sutton.
Vessels of war, &c., construction and equipment of—316—A. McLaine.
Water-closet and urinal, combined—385—J. Dence.
Wheels, axles, &c., construction of—237—J. Rogers.
Wheels, breaks for—308—R. A. Brooman.
Windmills—314—T. Eccles.

PATENTS SEALED.

2140. F. C. P. Hoffmann.	2166. J. Lewis.
2141. W. Welden.	2167. R. Young.
2149. B. L. Burnett.	2186. T. Fisher.
2153. J. Miles.	2213. W. H. Tucker.
2156. J. Snider, jun.	2252. J. A. Whipple.
2158. G. Russell.	2266. G. Lewal.
2160. P. Joyot, jun.	2779. G. Haseltine.
2163. T. Erich.	3007. P. G. Gardiner.
2164. G. W. Ewens.	3261. S. S. Gray.

From Commissioners of Patents Journal, February 23rd.

PATENTS SEALED.

2170. C. H. Corlett.	2281. A. Chaplin.
2175. A. A. Beaumont.	2285. J. G. Ulrich.
2182. J. Loebl and I. Pick.	2290. J. Allen.
2184. C. G. Kelvey and W. Holland.	2293. G. Davies.
2187. W. Lorberg.	2359. A. V. Newton.
2194. R. Batt.	2739. R. Smith.
2195. C. H. Adames.	2800. W. R. Bowditch.
2196. G. B. Rennie.	2910. J. Colling and D. G. Pinkney.
2204. J. H. Cutler.	2939. D. W. Hamper.
2208. T. H. Baker and G. Friend.	3016. E. A. Inglefield.
2211. J. D. Jack.	3077. C. Brown.
2215. W. H. Hawksworth.	3181. A. V. Newton.
2222. W. Clark.	3231. W. L. Winans and T. Winans.
2271. B. Latchford.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

470. T. Spencer.	506. J. Taylor, junr.
516. J. Wilson.	513. W. J. Hay.
492. W. H. James.	518. C. Beslay.
520. W. Rose and T. Crowder.	483. L. A. Bigelow.
500. W. Whalley.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

547. W. Wood.	571. W. Macfarlane.
568. W. Mills.	596. H. D. P. Cunningham.
632. T. Brown.	597. T. H. Jennens.

Registered Designs.

Rack pulley—4619—Feb. 4—W. Tonks and Sons, Birmingham.
A portable folding whatnot dinner waggon or sideboard—4620—Feb. 18—John Mead, Abridge, Essex.
The Alexander drag—4621—Feb. 27—Jas. Evans, Liverpool.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, MARCH 11, 1864. [No. 590. Vol. XII.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at 8 o'clock.

March 16.—"On the Organisation of the Corps Impérial des Ponts-et-Chaussées in France." By George R. Burnell, Esq.

March 23.—Passion week. *No meeting.*

March 30.—"Artificial Light and Materials Used for Lighting." By B. H. Paul, Esq.

Cantor Lectures.

The next lecture of Mr. Burges's course will be delivered on Monday next, at eight o'clock.

Mar. 14.—Lecture VI.—*Furniture.*—Mediæval furniture, oak and painted; Renaissance; 16th and 17th centuries; modern.

Mar. 21.—Lecture VII.—The Weaver's art; Mediæval, Eastern, modern.

Dwellings of the Labouring Classes.

The Council have passed the following resolutions:—

"That a Conference of the Society be summoned to consider the causes of the present unsatisfactory condition of the Dwellings of the Labouring Classes, and whether there are any remedies which can be advantageously adopted."

"That, besides inviting the attendance of any members of the Society taking an interest in the subject, the cooperation of such as are members of the Legislature as well as of the Presidents of the Institutions in union, be especially requested."

"That the Chairman of the Council, Lord Henry G. Lennox, M.P., Mr. Marsh, M.P., Mr. Cole, C.B., and Mr. C. Wren Hoskyns, be a committee to make the arrangements for the Conference, and to invite thereto any other persons whose presence they may think desirable."

Prizes for Art-Workmen.

The Council of the Society of Arts hereby offer prizes for Art-Workmanship, according to the following conditions:—

I. The works to be executed will be the property of the producers, but will be retained for exhibition, in London and elsewhere, for such length of time as the Council may think desirable.

II. The exhibitors are required to state in each case the price at which their works may be sold, or if sold previous to exhibition, at what price they would be willing to produce a copy.

III. The awards in each class will be made, and the sums specified in each class will be paid, provided the works be considered of sufficient merit to deserve the payment; and, further, in cases of extraordinary merit additional awards will be given, accompanied with the medal of the Society.

IV. Before the award of prizes is confirmed, the candidates must be prepared to execute some piece of work sufficient to satisfy the Council of their competency.

V. *Bona-fide* Art-workmen only can receive prizes.

VI. All articles for competition must be sent in to the Society's house on or before Saturday, the 26th of November, 1864, and must be delivered free of all charges. Each work sent in competition for a Prize must be marked with the Art-workman's name, or, if preferred, with a cypher, accompanied by a sealed envelope giving the name and address of the Art-workman. With the articles, a description for insertion in the catalogue should be sent.

VII. Although great care will be taken of articles sent for exhibition, the Council will not be responsible for any accident or damage of any kind occurring at any time.

VIII. Prices may be attached to articles exhibited and sales made, and no charge will be made in respect of any such sales.

IX. All the prizes are open to male and female competitors, and in addition, as regards painting in porcelain, decorative painting, and wall mosaics, a second set of prizes of the same amounts will be awarded among female competitors. If a female desires to compete in the female class only, she must declare her intention accordingly. The originals of the works prescribed may be seen at the South Kensington Museum, in the gallery at the entrance to the Sheepshanks pictures.

Casts may be seen at the Society of Arts, Adelphi, London, and the Schools of Art at Edinburgh, Dublin, Manchester, Glasgow, Birmingham, and Hanley in the Potteries.

Photographs, engravings, &c., may be purchased at the Society of Arts, John-street, Adelphi, at the prices named.

⁎ The Council are happy to announce that several of the works which received first prizes in the competition of 1863, have been purchased by the Department of Science and Art, to be exhibited in the South Kensington Museum and the Art Schools in the United Kingdom.

1st Division.

Works to be Executed from Prescribed Designs.

For the successful rendering the undermentioned designs in the various modes of workmanship according to the directions given in each case. Chromolithographs, woodcuts, photographs, and casts of such designs, will be sold at the Society's house at cost price.

Class 1.—Carving in Marble, Stone, or Wood.

(*a.*) *The Human Figure.*—One prize of £15 for the best and a second prize of £7. 10s. for the next best work executed in marble or stone, after the Boy and Dolphin cast from a chimney-piece, ascribed to *Donatello.* Original in the South Kensington Museum, No. 5,896. Dimensions to be one-eighth less than the cast.

[Cast—Fifteen shillings. Photograph—One shilling.]

(*b.*) *Ornament.*—One prize of £10 for the best and a second Prize of £5 for the next best work executed in marble, stone, or wood after a carved chair-back in the possession of Henry Vaughan, Esq. Dimensions to be two-thirds of the cast.

[Cast—Twelve shillings. Photograph—One shilling.]

c. Ornament.—One Prize of £10 for the best, and a second Prize of £5 for the next best work executed in stone, after a *Gothic bracket* in the Architectural Museum Dimensions the same as the cast. In this design the details may be improved by the introduction of small animals, and the human head may be changed according to the taste of the art-workman.

[Cast—Ten shillings; Photograph—One shilling.]

(*d.*)—One prize of £20 for the best, and a second prize of £10 for the next best, work carved in *wood* after a design by *Holbein*, as an *Inkstand* or *Watch-Holder* on three feet. Diameter of body to be eight inches.

[Wood Engraving—Sixpence.]

(*e.*)—One prize of £15 for the best, and a second prize of £7 10s. for the next best, work carved in wood after the *Head of a Harp* of the period of Louis XVI., in the South Kensington Museum, No. 8531. The head and bust only need be fully completed. Dimensions the same as the cast.

[Cast—Thirty shillings; Photograph—One shilling.]

(*f.*) *Ornament.*—One prize of £10 for the best, and a second prize of £5 for the next best work carved in wood after an *Italian picture frame* in the possession of Henry Vaughan, Esq. Dimensions—Twelve inches high, sight measure.

[Photograph—One shilling.]

CLASS 2.—REPOUSSÉ WORK IN ANY METAL.

(*a.*) *The Human Figure as a bas-relief.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Raphael's* "*Three Graces.*" Dimensions—The figures to be six inches high.

[Photograph—One shilling.]

(*b.*) *Ornament.*—One prize of £5 for the best and a second prize of £3 for the next best, work executed after a Flemish salver in the South Kensington Museum, date about 1670, No. 1153. Dimensions—Twelve inches in diameter.

[Photograph—One shilling.]

CLASS 3.—HAMMERED WORK, IN IRON, BRASS, OR COPPER.

Ornament.—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed after the portion shown in the Photograph of the Pediment of a Gate (German work, date about 1700,) in the South Kensington Museum, No. 5979. To be adapted for use as a bracket. Dimensions—12 inches deep.

[Photograph—One shilling and threepence.]

CLASS 4.—CARVING IN IVORY.

(*a.*) *Human Figure in the round.*—One prize of £15 for the best and a second prize of £10 for the next best, work executed after an *Ivory*, by *Fiamingo*, in the possession of John Webb, Esq. Dimensions—the same as the cast.

[Cast—One Shilling.]

(*b.*) *Ornament.*—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed after a pair of *Tablets*, in the possession of John Webb, Esq. Dimensions—the same as the cast.

[Cast—One Shilling.]

CLASS 5.—CHASING IN BRONZE.

(*a.*) *The Human Figure.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after a reduced copy of "*Clytie.*" A rough casting in bronze, on which the chasing must be executed, will be supplied by the Society, price, 12s.

A plaster cast may be obtained from D. Brucciani, 39, Russell-street, Covent-garden, W.C., price, 3s. 6d.

(*b.*) *Ornament.*—One prize of £10 for the best and a second prize of £7 10s. for the next best, work executed after *Goutier*, from a cabinet in the possession of Her Majesty the Queen. A rough casting in bronze, on which the chasing must be executed, will be supplied by the Society. Price 2s. 6d.

[Plaster Cast—One shilling.]

CLASS 6.—ETCHING AND ENGRAVING ON METAL—NIELLO WORK.

Ornament.—One prize of £10 for the best and a second prize of £5 for the next best, work executed after arabesques by Lucas Van Leyden, 1528. No. 18,968 in the South Kensington Museum. To be engraved the height of the photograph, and, if round a cup or goblet, repeated so as to be not less than nine inches in length when stretched out.

[Photograph—Sixpence.]

CLASS 7.—ENAMEL PAINTING ON COPPER OR GOLD.

(*a.*) *The Human Figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Raphael's design of the* "*Three Graces,*" executed in *grisaille.* Dimensions—The figures are to be four inches high.

[Photograph—One shilling.]

(*b.*) *Ornament.*—One prize of £5 for the best and a second prize of £3 for the next best, work executed after a German arabesque (16th century). No. 19,003 in the South Kensington Museum. Dimensions—The same as the Engraving.

[Engraving—Sixpence.]

CLASS 8.—PAINTING ON PORCELAIN.

(*a*) *The Human Figure.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Raphael's* "*Two Children,*" in the cartoon of "*Lystra.*" Dimensions—the same as the Photograph. This work is to be coloured according to the taste of the painter.

[Photograph—Ninepence.]

(*b.*) *Ornament.*—One prize of £5 for the best and a second prize of £3 for the next best, work executed after arabesques by Lucas Van Leyden, 1528, No. 18,968 in the South Kensington Museum, and coloured according to the taste of the painter. Dimensions—Double the size of the Photograph.

[Photograph—Sixpence.]

N.B.—See conditions, Section IX.

CLASS 9.—DECORATIVE PAINTING.

(*a.*) *Ornament.*—One prize of £5 and a second prize of £3 for a work, executed after an *ornament*, from *Castel R. Pandino*, near Lodi, from a drawing in the South Kensington Museum, No. 1150.

[Coloured Print—One Shilling.]

(*b.*) *Ornament.*—One prize of £5 and a second prize of £3 for a work, executed after a *picture frame*, in the South Kensington Museum, No. 7820. Dimensions—5 feet by 3 feet $11\frac{1}{2}$ inches, outside measure. The works

to be executed on canvass, either with or without stretchers, in cool colours. Some lines of the mouldings may be gilt.

[Photograph—One shilling and sixpence.]

N.B.—See conditions, Section IX.

Class 10.—Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.

Ornament.—One prize of £5 for the best and a second prize of £3 for the next best, work executed after a specimen in the possession of the Hon. John Ashley. Dimensions—one-third larger than the Lithograph.

[Outline Lithograph—One shilling.]

Class 11.—Cameo Cutting.

(*a.*) *Human Head.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Wyon's* heads of the Queen and the Prince Consort, on the Juror's medal of 1851.

(*b*) *Animal.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Wyon's "St. George and the Dragon,"* on the Prince Consort's medal. Dimensions the same as the casts.

[Casts—Sixpence each.]

Class 12.—Engraving on Glass.

Ornament.—One prize of £5 for the best and a second prize of £3 for the next best, work executed after arabesques by Lucas Van Leyden, 1528. To be engraved the height of the engraving; and if round a glass or goblet, repeated so as to be not less than 9 inches long when stretched out.

[Engraving—Sixpence.]

Class 13.—Wall Mosaics.

Human Head.—One prize of £15 for the best and a second prize of £10 for the next best, work executed after *Bertini*, of Milan. A preparatory drawing must be made, coloured, after the lithograph, on which the lines and disposition of the Tesseræ must be marked. The dimensions of the work to be regulated by the size of the Tesseræ proposed to be used, which size may be left to the choice of the artist. Although desirable, it is not necessary to execute the whole subject in actual mosaic, but if a part only be done, the eye must be in such portion. A coloured drawing, with Tesseræ, may be seen at the Society's house, and in the South Kensington Museum, and Tesseræ of two sizes may be obtained from Messrs. Minton, Stoke-upon-Trent, and Messrs. Maw and Co., Brosely, Shropshire.

[Lithograph Outline Coloured—Two Shillings.]

N.B.—See conditions, Section IX.

Class 14.—Gem Engraving.

(*a.*) *Human head.*—One prize of £10 for the best and a second prize of £5 for the next best work executed after an original in the possession of John Webb, Esq. Dimensions—the same as the cast.

[Cast—Sixpence.]

(*b.*) *Full-length figure.*—One prize of £10 for the best and a second prize of £5 for the next best work executed after an original in the possession of John Webb. Esq. Dimensions—the same as the cast.

[Cast—Sixpence.]

Class 15.—Die Sinking.

Human head.—One prize of £10 for the best, and a second prize of £5 for the next best work executed after the head of the Prince Consort, by *Wyon*, on the Society's medal. Dimensions half the size of the original.

[Cast—Sixpence.]

Class 16.—Glass Blowing.

Ornament.—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed after an original in the South Kensington Museum, No. 1813. —Dimensions as given in the wood engraving.

[Lithograph—One shilling.]

Class 17.—Bookbinding and Leather Work.

(*a.*) *Bookbinding.*—One prize of £7 10s. for the best and a second prize of £5 for the next best work executed in bookbinding, after an Italian specimen in the South Kensington Museum, No. 7,925. The work to be bound should be some classical author of the size given. Dimensions—the same as the photograph.

[Photograph—One shilling.]

(*b.*) *Leatherwork.*—One prize of £7 10s. for the best, and a second prize of £5 for the next best work of boiled and cut leatherwork for the outside covering of a jewel casket. Original in the South Kensington Museum, No. 7768. Dimensions—one-third larger than the photograph.

[Photograph—One shilling and sixpence.]

Class 18.—Embroidery.

Ornament.—One prize of £5 for the best and a second prize of £3 for the next best, work executed either after a German example in the Green Vaults at Dresden, or an Italian Silk in the South Kensington Museum, No. 7468, which may be adapted to a screen. Dimensions, according to the taste of the embroiderer.

[Photograph—German, Sixpence; Italian, One shilling.]

2nd Division.

Works to be Executed without Prescribed Designs.

Wood Carving.

(*a.*) *Human figure in alto or bas relief. Animals or natural foliage may be used as accessories.* 1st prize of £25 and the Society's Silver Medal. 2nd prize of £15. 3rd prize of £10.

(*b.*) *Animal or still life. Fruit, flowers, or natural foliage, may be used as accessories.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

(*c.*) *Natural foliage, fruit, or flowers, or conventional ornament in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

(By order)

P. LE NEVE FOSTER, *Secretary.*

Malta Exhibition.

The following is the letter of which a short notice only could be given in last week's *Journal*:—

Malta, Valetta, 18th February, 1864.

Sir,—As President for the time being of the Society of Arts and Commerce, established in 1862, in connection with your admirable institution, I feel it my duty to let you know, for the information of the Council, that the Society of Arts, Manufactures, and Commerce of Malta have accepted a proposition made by one of their members (Commander Strickland), and have appointed a direction for organising a general Exhibition of the Arts and Industry in these islands, with a view to their promotion and advancement.

The subject was brought under the cognisance of the Board of Trade during last summer, and was by that

department strongly recommended to the notice of his grace the Secretary of State for the Colonies. The Duke of Newcastle was pleased to approve of the scheme, and caused a letter to be written to the directors, and a copy forwarded to the local government.

I have the honour to enclose you likewise the programme of our exhibition, put forward in May of last year, as well as a list of the sections into which the industry of the place has been divided, and the rules framed for guidance.

The nobles and gentry of Malta have guaranteed a sufficient sum to cover all probable expenses.

The Government having been able to grant a magnificent public hall for the exhibition to be held in, one of the greatest causes of expenditure, viz., building, is removed.

I also have the honour to enclose extracts from the local journals, in which the first general meeting of the heads of sections is reported, and which will enable your Council to judge of the reasons which the Directors of the Maltese Exhibition have to look forward to a good success.

It would conduce highly to this most desirable end, if the Council of your Society could arrange to have sent out to Malta for this Exhibition, on loan, some articles likely to be adopted by Maltese artisans, and which could improve and facilitate their works; amongst others, the Directors would be gratified to receive tools for carpenters, blacksmiths, &c.; materials used for staining and varnishing wood, planing instruments for smoothing the surface of soft stone, trowels for plastering walls, and some models of machines for cleaning cotton and preparing it for spinning.

Arrangements have been made with the P. and O. Steam Navigation Company to forward any packages directed to the Maltese Exhibition. The Directors would undertake to have all articles returned to the Society after the Exhibition is closed.

I have the honour to be, Sir, &c.,

Marquis P. TESTAFERRATA OLIVIER.

To the Secretary of the Society of Arts.

P.S.—It is intended that the Exhibition should be opened about the second week of April next.

The Council have applied to the Cotton Supply Association of Manchester to contribute to this Exhibition, and they have pleasure in stating that that body has consented to forward gins for cleaning cotton of the most approved construction, and these gins are offered by the Association as prizes to the most successful growers of cotton in that district.

The Council will take steps for getting a good representation of the tools and materials referred to in the letter, and they hope that members of the Society who may be manufacturers of such articles will assist in this matter.

Proceedings of the Society.

CANTOR LECTURES.

FINE ARTS APPLIED TO INDUSTRY. BY W. BURGES, ESQ.

FIFTH LECTURE, MONDAY, MARCH 7.—GOLD AND SILVER.

It appears that, although considerable documentary evidence exists as to the excellence of the antique works in gold and silver, the value of the material has caused an almost complete destruction of the objects themselves, and we have, consequently, but little to learn from this quarter; on the contrary, a comparatively large quantity of mediæval plate and jewellery has come down to our own day, to say nothing of the numerous and curious inventories so frequently met with; the most instructive of these latter being that of Louis, Count of Anjou, taken somewhere about the year 1360, and which has been published in the work of M. de Laborde, on "The Enamels in the Louvre." The various processes applied to the working of the precious metals in the middle ages were then described, and a short list given of the principal vases and ornaments demanded for the decoration of the Church and for secular uses. Much regret was expressed at the want of art education, not only among the workmen, but among the tradesmen themselves; the old silver and goldsmiths, such as Cellini, being both tradesmen and artists. The next part of the subject touched upon was jewellery. Great praise was given to the ornaments of the ancient Etruscans, which were literally "jewels of silver and jewels of gold." The higher sort of mediæval jewellery appears, on the contrary, to have consisted almost entirely of precious stones, only such an amount of metal being used as was necessary to bind them together. The jewellery of the renaissance formed a third variety, being distinguished by the little figures and ornaments covered with enamel. The lecturer then drew attention to the modern revivals of Etruscan work by Signor Castellani, of the mediæval by Messrs. Hardman and Co., and of the renaissance by Mr. Hancock and Messrs. Widdowson and Veale. Mr. Green's jewellery was also noted for the good taste generally displayed. Finally, a few words were added on the coinage and the necessity of a great improvement with regard to that in present use, the example of the Greeks being adduced, whose coins were objects of the highest art, and the dies for which are supposed to have been made by the same artists who engraved gems. The Italian money of Louis XII. was also brought forward as a most excellent example, exhibiting, in its way, nearly as good art as the Greek coins, while it possessed the great advantage of being easily piled—the want which, in the present day, would be considered a great defect in the antique examples. The lecture was illustrated by some very excellent examples of plate and jewellery. Thus Mr. Eastwood contributed some choice specimens of Etruscan and Anglo-Saxon jewels—among the former was a bracelet, which contained beads frosted with minute gold dust. Mr. Boore contributed some curious ancient chalices. Mr. Green sent a case of very exquisite modern jewellery, and Messrs. Hardman and Co. of modern mediæval, while the display of diamonds and precious stones was due to the courtesy of Messrs. Widdowson and Veale, and of Mr. Lambert, the latter of whom was a most liberal contributor of 16th and 17th century plate, among which a figure of Vulcan (in silver) demands special notice. Mr. Pairpoint lent two excellent bossed-up figure medallions, and several other beautiful works in silver were contributed by Messrs. Elkington and Co.

THIRTEENTH ORDINARY MEETING.

Wednesday, March 9th, 1864; Samuel Gurney, Esq., M.P., in the chair.

The following candidates were proposed for election as members of the Society:—

Barber, Thomas Archer, 2, Scott's-place, Lower-road, Islington.
Cheesewright, Charles, Alma-terrace, Highbury, N.
Hales, Edward, Dover.
Salt, Thomas Partridge, Ashton-villa, Moseley, Birmingham.
Slee, Edward, Church-street, Horselydown, S.E., and Clapham-park, S.

The Paper read was—

ON FISH HATCHING.

By Frank Buckland, M.A., M.R.C.S., F.Z.S.

It is with very great pleasure I avail myself of this opportunity of addressing you on the subject of the artificial breeding of fish, and I trust that when you have heard what I have got to tell you, you will agree that it is one of the most practical applications of the study of natural history that has been brought to notice of late years. The mode of hatching valuable fish, such as the trout and salmon, by artificial means, is no longer an experiment. It has, I have been pleased to see, been lately gazetted by public consent to the rank of science, which is every year attracting more and more attention. I shall not weary you by entering into the history of the art, suffice it to say, that the first discoverers were two poor French fishermen, Gehin and Remy—all honour to their names for the great good they have done to their fellow creatures.

You will find in books a statement repeated over and over again—a fault very common in treatises on natural history—that the Chinese were the first to practice pisciculture, but let me tell you what their pisciculture consists of. They have no idea (I have it from the best authority, viz., of officers in the army who have travelled there) of hatching fish in troughs, such as we see in European establishments, nor have they yet arrived at the practice of impregnating the eggs artificially. What they do is this:—they observe the spawn of fish, as you yourself may also do this spring in the Thames, hanging about the bushes, having been placed there by the fish themselves; they collect this spawn, hang it up in tubs and ponds, and let it hatch out of itself; but though they have not the science that we have, yet they are pisciculturists in a most practical manner, for I have it on the authority of an eyewitness, that when the Chinese flood their paddy or rice fields, with water, they turn out into these flooded fields large numbers of fish, which feed upon the worms, insects, &c., which they find in the mud, and this without injury but rather benefit to the plants themselves. When the fields have had enough water the Chinese water-farmer opens the hatchways, catches what fish are fat enough, and sends them to market; the others he lets out into another fresh-flooded paddy field for another pasture. In fact, the Chinese herd their fish and drive them from one pasture to another, just as a shepherd drives his sheep from one turnip field to another. These fish are, I believe, great, coarse things, and appear something between a chub and a tench. There are, I believe, no representatives of the Salmonidæ in China.

Leaving the history of the subject at this point, I would now proceed to the practice of the art. There may be some who say why not let the fish breed for themselves? Doubtless, if left alone in a perfect natural state, they would multiply themselves to an enormous extent, as is the case, I am told, at Petropaulouski, where the salmon are occasionally left high and dry by the subsiding of the floods, and such numbers of them perish in this way as to cause a plague by the putrefaction of their bodies.

When we consider the vast number of eggs which nature has given to fish, it is a wonder, indeed, that all the world is not fish.

The *eggs* of fish are simply the hard roe of fish; and if you examine the next red herring for breakfast you will find that the hard roe is composed of a large number of little balls, each of which might possibly come to a fish. You will find in books on natural history the number of eggs in fish. Not trusting altogether to these statements, I have been at some considerable pains to count the eggs* of the following fish. To begin with the salmon, these fish carry about 1,000 eggs to a pound of their weight, so if we can get a fish weighing twenty-five pounds we have no less than 25,000 eggs, that is to say, about as many eggs as persons composing the population of the city of Oxford.

The trout also, like the salmon, gives 1,000 eggs to every pound of her weight; the following table will give you some idea of the powers of multiplication in fish:—

	Weight of fish.	Total number of eggs.	Value if they *all* became marketable fish.
Salmon	20 ℔. at 2s. per ℔.	20,000	£40,000
Trout	1 ℔.	1,008	
Jack	4½ ℔.	42,840	
Perch	½ ℔.	20,592	
Roach	¾ ℔.	480,480	
Smelt	2 oz.	36,652	
Lump Fish.	2 ℔.	116,640	
Brill	4 ℔.	239,775	
Sole	1 ℔.	134,466	
Herring	½ ℔.	19,840	
Mackerel	1 ℔.	86,120	
Turbot	8 ℔. at 5s. each	385,200	£96,300
Cod	20 ℔.	4,872,000	
Sturgeon	4 cwt.	Three buckets and a half of caviare.	
Oyster		1,500,000 at 1d. each	£6,250

Salmon, at Worcester, are now selling at four shillings a pound. If, therefore, a female salmon, weighing 20lbs. deposited her eggs in some safe place, and they all eventually became marketable fish, which would be in three or four years' time, we should find that the eggs of this one salmon would yield no less than 178 tons 11 cwt. of salmon fit for food; and supposing we put this down at 2s. per lb., it would be worth £40,000, and at the present price at Worcester, 4s. per lb., the product of this veritable golden fish would be worth £80,000. Even supposing only a quarter of the young fish ever became marketable, still this one fish would yield a value of £10,000, and all without costing any human being a halfpenny for food.

It may be asked, therefore, what becomes of all the eggs of the salmon, trout, &c.? The same thing that happens to the common fowl eggs happens to the fish. In the case of the fowl, we ourselves eat many thousands of eggs, and we know how good they are for various culinary purposes; and as in the case of the fowl, so also with the fish eggs; there are enemies innumerable who seek to destroy them; even the water itself is occasionally antagonistic to their well-being.

First of all, then, many of the fish's eggs do not get at all impregnated, or, not becoming properly buried in the gravel, are washed away by the stream. In proof of this I would mention the following:—There are no good spawning places in the Thames; the fish—and the Thames trout are really fine fish—are therefore obliged to deposit their eggs in the rapids in the centre of the stream. Some of the nests where trout had been actually seen to deposit their eggs have lately been carefully examined, and not a single egg could be found—they had all been carried away by the stream, or devoured by insects, of which thousands were found in the nest. A friend, writing from Hampshire, says that he has examined the nests where the salmon

* The way to count the eggs is this:—Make a few cuts with a knife in the membrane which contains the roe, and then plunge them into water which is, at the moment of immersion, positively at the boiling point; being composed of albumen, the eggs obey the natural law and coagulate in an instant, then add a little common salt, and continue to boil the eggs, till they all become quite detached from the membrane and swim about in the water, loose like marbles; if any adhere to the membrane they should be gently removed by a short brush, or by shaking in the boiling water. I then, when all the eggs are quite loose, pour off the water and pour the eggs into a meat dish, drying them slowly either in the sun or in the oven, the door of which is left open to prevent their becoming baked into lumps. I then weigh the whole mass of the eggs, and put down the total weight on paper. I then weigh out five grains from the mass, and get them counted over carefully under a magnifying hand-glass, on white paper; this is ladies' work.

have been seen to spawn, but no eggs could be found. Even supposing the eggs have been properly deposited in the nests, down come the floods and overwhelm the place. Thus, my friend Mr. T. Ashworth informs me that at the beginning of the season over 275,000 eggs were taken from salmon and placed in his hatching boxes. Immediately after this was done down came the floods, and of the eggs which had been exposed to their violence hardly one could have survived. Then again, we have the reverse of floods, *i.e.*, the droughts, which leave the eggs exposed; or, as it happens in Hampshire, the fish lay their eggs in what is called "the drawings," the water is let off them, and the eggs, of course, perish. Fish, again, are great enemies to their own eggs. I have frequently seen myself two or three small trout hiding behind the nest, and as the female deposits her eggs, swim after and eat them up as they go along in the stream. Trout have also been often observed with their tails in the air robbing the nests. Even females will eat their own eggs. What wonder then that trout should be so scarce when both father and mother devour their offspring. I myself have frequently taken eggs which they had stolen from the spawning-beds, from the maws of trout, and my friend Mr. Ashworth tells me that he has actually hatched out 500 eggs taken from the mouth of one fish robber.

Supposing the eggs to have been properly laid in their nests, they become the prey of pests innumerable. The larva of the may-fly and the dragon-fly (justly called the river tiger) act the same part to the fish eggs in the water as do the hedgehogs and other vermin to the pheasant eggs on land.

The common water shrimp also has been accused of eating the eggs of fish, but I am beginning to think, from experiments I have made, that he is harmless, and purely a vegetable feeder. The Caddis worm has also been accused of eating trout eggs, but Miss Smee, the daughter of Mr. Alfred Smee, surgeon to the Bank of England, has tried experiments with the Caddis worm. Causing them to build their houses with coloured glass, amethyst, gold, silver, brass, &c., Miss Smee gave her Caddis worms some trout eggs, to see what they would do; they did not attempt to eat them, but simply made use of them to build their houses. Curious sight it must have been to see a Caddis in a house made of fish eggs.

Among birds the eggs have many enemies as well as friends. The chief of the former are common ducks, which, with their spade-like bills, soon get all the eggs out of their nests and devour them. The swans, though very graceful ornaments in a pond, do a deal of mischief to the fish, especially in the Thames. Two birds, the water ouzel and dabchick, have been accused as poachers after fish eggs.

I have examined the crops of several of these birds, and have invariably found them to contain the remains of insects, but no fish eggs. This matter was fully discussed at the Zoological Society, and the verdict first arrived at was "not proven," and on second consideration the water ousel was "fully acquitted from the charge of eating spawn." True it is he is ever feeding upon the spawning beds; he goes there to eat the insects that are devouring the eggs, but he does not touch them himself at all, and to accuse the bird of this fault upon mere circumstantial evidence, is about as good logic as to accuse a swallow—seen flying over a turnip field for the purpose of catching the turnip flies—of eating the turnips.

The moor hens, however, I am pretty well sure, will eat the eggs of the fish; a good observer tells me that one morning the moor hens got to his hatching boxes and cleared all the eggs out of them. There is another bird which does a great deal of harm to the fish hatcher. The Earl of Mountcharles hatched several fish last year, and placed them in a brook running through his garden, and though the trout were continually looked after they rapidly disappeared; another friend also writes to me to say that he has killed several kingfishers under the wires where his fish were confined. Herons also are terribly destructive to the fish in the spawning beds.

We have seen what becomes of the fish's eggs if they are left to themselves. It is necessary, therefore, for man to interfere, and take the eggs from the fish and keep them under his charge. In all matters of interference with nature we cannot do better than take nature herself as a guide. We observe the fish makes her nest of her own accord in a rapid, shallow, and gravelly stream. We therefore must put the eggs in an artificial nest where the following requisites are present—a stream more or less rapid—gravel—darkness—and perfect quiet. This stream must be allowed to run over the eggs perpetually, day and night, until the young fish are hatched out, just as it would do in the brook.

At the piscicultural establishment at Huningue, in France, the eggs are placed upon glass rods, such as I now show you, during the time of incubation. I would, however, most humbly beg to differ from the great authorities who use the glass bars, for, in the first place, the fish do not find glass bars at the bottom of the water to deposit their eggs, but they always find gravel; in the second, it is absolutely necessary that the egg should be perfectly motionless for some 35 or 40 days. If you place a round egg against two glass bars which are also round, the whole being under water, you at once get the best possible conditions for motion of the egg on the glass bar at the slightest touch, and you certainly do not get what you chiefly want—perfect immobility—for if the water be turned on from the tap a little too hard, or you happen to touch one egg with a camel hair brush, all the eggs in the box immediately run against each other and begin to dance and roll about. Again, when the young fish begin to hatch out, their umbilical bags very often get caught between the bars, and then they perish; or if they fall through, they get into water which is much too deep for them, and whence it is very difficult to extract them without disturbing every egg in the box. This is done in the French plan, by taking a cork out and letting the water run off from under the bars.

By placing the eggs *on gravel*, on the contrary, as you see in the boxes before you, all this difficulty is obviated. The eggs can be placed so that they do not touch one another, so that the dead ones do not contaminate their live neighbours, and may be easily picked out by the ingenious pair of forceps which I have now in my hand, so that the inequalities of the gravel will keep them perfectly steady, so that the young fish when coming out of the egg—like the young snake casting his skin in a furze bush—may have facilities afforded him to get rid of his shell, and be not like his neighbour on glass bars, who slips about thereon like a clumsy skater upon well-swept ice.

You will observe, of course, when you examine the fish-hatching boxes now in the room, that we do not in one respect adhere to nature, that is, we do not cover the eggs with gravel, as does the parent fish. The only reason why the parent fish buries her eggs is because of the light, which is unfavourable. All roots and seeds of plants, we may observe, are buried in the ground; it would appear, therefore, that at first darkness is absolutely necessary for the development of the first germs of life. Again, if the eggs are exposed to the light, a nasty white fungus immediately appears upon them. All this is obviated in a moment by placing wooden covers on the boxes, for these keep out all the light, and obviate all the inconveniences of bringing the eggs where you cannot see them, and cannot watch their progress.

Apparatus.

Now, there are two kinds of hatching apparatus which may be used—one out of doors for carrying out operations on a large scale, and the other for use on a smaller scale in-doors.

I far prefer the indoor apparatus, which is very simple in construction, more certain of success, cleaner, neater, and at the same time affords the great pleasure to the

owner of being able to observe the progress of the eggs. The slate boxes on the table are those used by my friend Mr. Ponder, at Hampton, in which he has hatched so many thousands of fish, paying for the boxes out of his own pocket, and giving his time gratuitously for the Thames Angling Preservation Society; they are 3 feet long and 3½ inches deep; they should be placed one above the other, after the manner of the steps of a staircase, and so arranged that the water runs through them all in a zigzag manner; some gravel, about the size of peas, must be obtained from a gravel pit, not the river side; it must be boiled well to destroy all the seeds of vegetation, be washed perfectly clean, and then placed in the troughs, so that there should be an inch of gravel, an inch of water, and an inch above the water; place in the eggs—put on the wooden covers—see that the stream runs properly, and leave them entirely alone in the 26 boxes. Such as these have this year, at Hampton, hatched out and are still hatching out no less than 124,700 fish and eggs.

Whereas, it requires a large number of eggs to fill these boxes, and there are many private gentlemen who wish to hatch a few eggs, say about 5,000 or 10,000, Mr. King, the aquarium naturalist, of 190, Great Portland-street, has devised, with myself, the troughs which you now see upon the table in full operation. He calls them the rustic pottery troughs; and as you see, they are easily fitted upon a stand, after the manner of a geranium stand.* Besides looking neat and ornamental, they can in the summer be used as flower-pots. They are, too, very suitable for hatching fish in London houses. All that is requisite is a gentle and incessant flow of water, and what is water enough for one trough is, as a matter of necessity, enough for half-a-dozen or so. In London houses the supply of water is often limited; it is a comfort, therefore, to know that the same water can be used again twice or three times. In my own small front kitchen, at 156, Albany-street, Regent's-park, for instance, I have utilised an old regimental hospital bath, which I fill when the water comes in of an afternoon. The water will not last me nearly all day, so it is conveyed out into the area, runs through a second lot of troughs placed along the area wall, then into two large common tubs; when the bath gets nearly empty, my servant boy pumps all the water back again, by means of a hydropult,† a most useful instrument, almost indispensable to a person who wishes to hatch fish in any locality where the water supply is limited. I can only say that I shall only be too delighted to let any one interested in the subject see my apparatus; it shows how much can be done by the simplest means.

If you wish to hatch your fish in boxes out of doors, you must adopt the same principle as that applied to in-door boxes, recollecting the requisites—a clear running stream, clean gravel, and darkness. Full details of both in-door and out-door apparatus, and also the proper mode of working them, can be found in my little book.‡ Both modes of operation can, at this moment, be seen in full operation—the one at Mr. Ponder's house, Elm-grove, Hampton; the other at the Christian Spring, in the village at Hampton; and both of these sets of boxes Mr. Ponder will, I am sure, be glad to show to any of my audience. At Twickenham, the Acclimatisation Society have also erected an apparatus, which is now in full work; Mr. Francis Francis, who has full charge of this establishment, will, I am convinced, be pleased to show his mode of operation to visitors. These two societies, I would venture here to remark, at Hampton and at Twickenham, are by no means in opposition to each other. The Thames Angling Society hatch fish for the Thames only; the Acclimatisation Society for the distribution of eggs and young fish at a price, to those who wish to re-stock their waters.

The eggs having been placed in the boxes and left totally undisturbed, in course of time the eyes of the young fish will be seen like two black spots in the egg. The time required for this appearance to exhibit itself depends entirely on the temperature.

The proper temperature* of the water, both in and out of doors, ought to range from 40° to 50°. Mr. Ponder's observations tell him that at this temperature it requires thirty-five days for the eyes to appear (*i.e.*, that the fish is formed in the eye), and that they hatch out fourteen days afterwards; the same result has been obtained by him for two seasons following, with very little variation. Again, he has observed that when the temperature was 50° (in the spring of the year) the eyes of the fish were visible in twenty-six days, and that he hatched them out in ten days afterwards. Lay it down, however, for an axiom that the higher the temperature for the egg the weaker the fish produced from the egg; anything above 50° is weakening.

The first fish hatched out from a batch are the weakest, the last are the healthiest; when, however, they once begin to hatch they will come out all in a mass, two, three, or four thousand of a morning. The proper temperature for trout and salmon eggs is 40° to 50°, and again I repeat it, anything over 50° is weakening.

Grayling, however, appear to be an exception to this rule. Mr. Ponder has obtained a fair supply of the ova of these fish, which the Thames Angling Preservation Society are introducing in the Thames. The quantity obtained amounted to between fifteen and twenty thousand, and though several of these died, for they are most delicate things to carry, the remainder did very well; they are much more delicate than trout ova, both in appearance and hatching, and seem to die at the least provocation; they are beautifully transparent, and, when viewed in the sun, of a lovely opalescent hue. He has discovered about these a most interesting, and, I believe, a novel fact. The body of the fish is perfectly visible in nine days, and the fish will actually hatch out of the egg in fourteen days.

All difficulties and trouble with the eggs having been overcome, we are at length rewarded by seeing the young fish begin to come out of the egg; at this time the tail of the fish may be observed moving from side to side with a rapid vibratory movement inside the egg. The young fish, when hatched, increase in size daily, and the darkening of the transparent substance which would eventually be the body, and the development of the fins, have already proved one fact, and this (as the question has frequently been put to me) I shall venture now to mention. The eggs do not grow—*i.e.*, they do not increase in circumference or in diameter—but the fish inside the egg most certainly increases in bulk, till at last it becomes so large that the egg-shell suddenly bursts, and out comes the young fish.

I have never yet seen a more beautiful sight than the gradual development of the young salmon and trout. We begin with a globule of albumen (or white of egg); we see within it a faint line, and two black spots; day by day these become larger, till the young fish is born. Time goes on; the umbilical vesicle is absorbed, the colour appears on the scales, the long single crests, which one observes at birth as running down the upper and lower parts of the body, resolve themselves, as it were by magic, into the various fins distinctive of the adult creature, and we have a perfect fish before us. Nature, ever wonderful in her works, surpasses herself in the beauty and minuteness of the finish of the little fish.

It is most interesting to watch an egg at the moment of hatching. If you have luck you might happen to be gazing on a particular egg, when of a sudden you will see it split in twain, at the part corresponding with the back of the

* The set of boxes now exhibited will be placed in the Royal Horticultural Gardens, South Kensington, in the course of the week.

† Mr. Button, maker, 27, Leadenhall-street.

‡ Fish-hatching. Tinsley Brothers, Catherine-street, Strand. Price 5s.

* I here quote from my book.

fish; you will then see a tiny head with black eyes and a long tail pop out, and you will see the new-born creature give several convulsive shudders in his attempts to free himself from the now useless shell. Poor little fellow! he can't manage to get out—the shell is too tight for him. Take, therefore, a soft hair pencil, press lightly on the egg-shell—he seems to know you are his friend—he gives another vigorous kick or two, and presto! he is free, and has commenced life. If we judge from his motions, he must enjoy life, for away he swims, as fast as his tiny and wriggling tail will carry him, round and round in a circle, and then plump down he goes to the bottom of the tank, and reclines on his side, breathing freely with his gills for the first time in his life.

It would appear that it is not possible for the fish to remain long enough in the egg to come out ready to eat food at once, as is the case with ovo-viviparous creatures. They have, therefore, attached to their belly a bag, which contains the nourishment which the young fish must absorb into their system before they are able to shift for themselves. The moment the contents of the bag are gone, they at once begin to feed with the mouth.

In various creatures the progress of development is different. Thus, for instance, in the human baby, the first portion of the body developed is the lower jaw, and this for an obvious reason, because the most material want of the baby is to obtain the mother's milk by suction. Now, if the lower jaw were not solid and firm, in vain would it try to suck.

Now, in the case of the fish, nature has kindly packed up all the nourishment that it will want for some six or eight weeks in a neat little bag or parcel, which she has affixed to the body of the fish in such a manner that it shall be absorbed into the general system; the fish does not suck milk like a warm-blooded animal, as its lower jaw is not developed.

What is, then, the most important organ to the young fish? He has numerous enemies, and it is his first object to get out of their way. The eyes, therefore, are the organs which first arrive at perfection, and they are indeed perfection in this minute, jelly-like creature. The eye is in perfect working order at the moment of birth, though the rest of the body is far from complete.

It has long been supposed that there was a duct or tube which conveyed the nourishment from the bag to the body of the fish. My friend, Mr. H. B. Hancock, has carefully examined on this point. He reports as follows:—

"On examining into the course of circulation I find that the blood is conveyed from the heart (which is visible just under the gills of the fish) into the liver by a branch of the large trunk artery, which, after giving out branches to the intermediate spaces between the ribs, to the kidneys, &c., is finally lost in the muscular fibre of the tail; that from the liver, part proceeds from the large vein straight to the heart; the remainder, after ramifying over the umbilical vesicle of the fish, is finally collected in the large vein (*inferior vena cava*?) bordering the front part of the vesicle and returned to the heart, taking with it a portion of the contents of the vesicle received by absorption, which, being transmitted to the liver, is there assimilated, and again conveyed to the heart by the large vein for circulation in the body of the fish."

One of my many visitors to the tanks at the *Field* office, where I exhibited the process last year, was narrating to me how he once caught an enormous salmon in the Tay, weighing some thirty odd pounds; this immediately put the idea into my head to weigh one of my salmon. He has, poor little wretch, a deal of way to make up before he arrives at thirty pounds, for at present (four days old) he hardly turns the scale at two grains.

By the kindness of Mr. Ashworth, of Cheadle, near Manchester, I am enabled to show you a drawing of the young fish who weighs about two grains, and about two days old. He has also given the following observations as regards the increase of weight in the young salmon:—The fry at three days old is about two grains in weight; at sixteen months old it has increased to two ounces, or 410 times its first weight; at twenty months old, after the smelt has been in the sea, it has become a grilse of eight and a half pounds; it has increased sixteen times in three or four months; at two years and eight months old it becomes a salmon of twelve to fifteen pounds in weight; after which its increased weight of growth has not been ascertained, but by the time it becomes thirty pounds in weight it has increased to 115,200 times the weight it was at first.

Among the numerous families which fishes bear, it could hardly be expected that all of them would be straight-limbed and healthy; we find, therefore, occasionally, but not very commonly, crippled and deformed fish. Thus I show you, this evening, diagrams and living specimens of a fish of a corkscrew shape, also of a fish with four eyes and one head, also of a salmon and of a charr with two heads and one body. I take the greatest care of these fish and trust they will live, and should they be caught hereafter by any angler they would astonish him.

As regards the practical treatment of the young fish, and the question as to when they should be turned out into the stream, as well as many other points, I would like to mention if time and space would permit. I must beg to refer again to my little book on Fish-Hatching Experiments.

Having had now two years' practical experience in hatching fish, I bethought me whether this year I could not somewhat add to the science of the matter, and have, therefore, instituted several experiments as regarded the duration of the vitality of the milt and ova, whether kept separate in bottles, or taken from dead fish. This, I am convinced, is a most important point, and it may possibly lead to many practical results. The first experiment which I tried was with a fish found dead in the river, having been killed by a heron, and which had probably been dead 24 hours. The eggs, which I impregnated with fresh milt, are now in my boxes, and very few of them have died.

I have also tried a series of experiments as regards keeping the milt and ova separate in bottles from times varying from 10 minutes up to 68 hours. The results hitherto have been favourable, but I cannot be certain that fish will hatch out of these eggs. Should, however, the experiment succeed, the important practical bearing of this will at once be perceptible. Thus, for instance I impregnated, at Worcester, some salmon ova fresh from the fish with trout milt, which had been 68 hours in a bottle, but very few of these eggs are as yet dead. Again, I brought some salmon eggs from Worcester, and impregnated them with fresh trout milt at Mr. Samuel Gurney's, Carshalton. The eggs in this case were 29 hours old. I here beg to thank Mr. Gurney for his great kindness and liberality in placing his trout at my disposal for experimental purposes.

It is generally a difficult matter to get the eggs, whether of trout or salmon, properly operated upon, and then sent from a distance to the hatching boxes; it, therefore, occurred to me that if I could possibly get the eggs from dead fish to hatch out equally as well as from live fish, it would save a great deal of time, great expense, as well as trouble. Fish, therefore, have been sent up to me by Mr. J. B. Bruce, of Woolston Lodge, Faringdon, and also from Mr. Gurney's, dead, packed in wet moss, and I have taken the eggs from them at 12 hours, 24 hours, and 80 hours. It is almost impossible to tell, from any test that I know of, whether these eggs have been properly impregnated. Time alone will prove this. If the experiment succeed, we shall be able to write to our friends in the extreme north of Scotland, or the furthermost part of Ireland, and ask them to catch the fish and send them to London, where they can be operated upon, just as well as though an express messenger had been sent many hundred miles to do it.

Those who have experienced the sad disappointments that I have with eggs sent even from short distances,

supposed to have been properly operated on, which arrive quite hard, white, and opaque, and, of course, dead (the cause of this being generally the shaking of the railway or other form of bad packing), can appreciate the immense advantage of operating on dead fish. Now, if we never unpack the eggs at all, and leave them as nature has herself arranged, then we shall—and I think you will agree with me—have more chance of success than by the clumsy attempts of human hands to send them in a tin or glass carrier. The only objection to the plan is, that the parent fish are of a necessity destroyed, which is not the case when they are operated on in the usual manner.

I have often been asked if operating on fish and taking their eggs from them killed them?—My answer is—that we have this year taken over one hundred thousand trout eggs, and have not killed, to my knowledge, one single fish, male or female. Those gentlemen, therefore, who have been good enough to allow us to operate on their fish,* whether salmon or trout, need not be in the least fear that any injury has been done to the fish, who, for aught I know to the contrary, may really feel much obliged to us for the trouble we have saved them in making their own nests and depositing their eggs on their own account.

It has been objected by some that these experiments with dead fish, and with milt and ova taken from fish, and kept separate many hours, have been tried before. In the *Field* of Feb. 27, 1864, "the Chronicler" quotes from M. Coste, the eminent and learned professor of embriology in the Collège de France, a statement that milt will remain alive for 24 hours. I have, however, carried my experiments further on this point, and have ascertained, through the kindness of my friend, Mr. H. B. Hancock, that the spermatozoa in the fish would live for so long a period as 141 hours, that is to say, six days all but three hours. It must, however, be remarked that both M. Coste and myself have separately come to the same conclusion, viz., that water must not be added to the dead fish till the moment that it is required for use, for it appears that the spermatozoa assume their peculiar vibratory quick action when water is added to them, otherwise they are quite quiescent. This is a most important point as regards the actual bringing the theory into practice.

I here desire to state, once for all, as I wish every one to remember, that I do not say that my experiment in keeping the milt and ova separate for so long a time will succeed, and that healthy young fish come from the egg, nor again am I at all sure that fish will hatch from eggs taken from the dead fish, but there is, however, no reason why the experiment should not be tried, for nature has many choice secrets in her laboratory which she has yet withheld from us, and which she will only disclose to us by asking her in the form of experiments, varied and repeated in every possible manner

Progress, and what Remains to be Done.

Thus far I have attempted to show what becomes of the eggs of the fish in their natural state; how they may be taken care of, and what great results may be, with good luck and careful management, obtained. I would venture now to report progress and the result.

The first originators and supporters of the important science of fish hatching for the public good were the French Government, who, with that liberality which encourages any private efforts for the public good, have, as most of you are aware, erected a magnificent series of buildings, which may be fairly denominated a fish manufactory, at Huningue, near Basle.

With the energetic and talented engineer of this establishment, my friend M. Coumes, I am proud to say I am personally well acquainted, and through his liberality I am now enabled to show a series of photographs of this beautiful establishment. The results obtained are somewhat stupendous. By the kindness of M. Coumes, from whom I have just received the latest news, I am enabled to give the following tables of fishes' eggs laid down in the troughs, and for particulars would refer to the official report, "Notice Historique sur l'Etablissement de Pisciculture de Huningue."*

Rhine Salmon. Great Lake Trout. Common Trout. Salmon Trout. Ombre Chevalier.		Pera or Lavaret.		Danube Salmon.		Ombre Commun.	
1854-5...	1,724,700	1854-5...	2,687,000	1855...	142,000	1855...	112,000
1855-6...	1,124,500	1855-6 ..	560,000	1856	241,649	1856...	369,500
1856-7...	2,784,030	1856-7...	2,471,000	1857...	257,900	1857...	105,450
1857-8...	3,149,843	1857-8...	3,573,500	1858...	80,600	1858...	64,750
1858-9...	4,531,700	1858 9...	4,590,000	1859...	30,000	1859...	57,000
1859-60.	4,282,800	1859-60.	3,859,000	1860...	114,000	1860...	325,000
1860-1...	5,729,100	1860-1...	8,997,000	1861. .	43,500	1861...	1,028,000
1861-2...	6,382,900	1861-2...	11,995,000	1862...	66,000	1862...	444,000
1862-3...	4,408,000	1862-3...	18,130,000	1863...	*	1863...	*
1863-4...	7,163,680	1863-4...	8,760,000				
In 10 years	41,281,253	In 10 years	65,622,500	In 8 years	975,649	In 8 years	2,505,700
		Grand Total	110,738,102				

* The number of Danube Salmon and Ombre Commun, in 1863, together, were 353,000.

For particulars as to the number of deaths, &c., I would refer to the published report above-mentioned. Over 50 per cent. in the 10 years of these eggs were distributed and hatched out.

Besides these, large numbers of young fish are distributed *after* they have absorbed the umbilical bag, and are fit to be turned out to shift for themselves. M. Coumes' report shows that in 1862, 97,400 trout, salmon trout, and ombre chevalier were distributed; in 1863, of Danube salmon and ombre commun, 61,000; in 1862, 18,500; in 1863, 5,000.

M. Coumes, in his letter to me from Strasbourg, dated March 5, 1864, desires me to announce "that the French Government have just instituted a commission (which apparently corresponds to our fisheries commissions) for the purpose of drawing up laws and regulations relative to the salmon and trout fisheries in France, and to procure for the fish a free passage in the rivers, and also to determine uniformly through the empire what engines for the purpose of taking fish may be lawful and what illegal." This is a great and important step in the right direction.

Through the liberality of the French government, many thousands of the eggs of salmon, trout, &c., nearly ready to hatch, have been distributed all this year and last year throughout England. Some of these very fish are now in the boxes before you. These distributions are made gratuitously to the inhabitants of both France and England alike, the only stipulation made being that those who shall receive the eggs shall duly and properly return the forms of what I may call "births and deaths."

I hope and trust that the day is not far distant when our own Government will see the importance of founding a similar establishment for the public good.

I must now mention what has been done in her Majesty's dominions. The first place established (that I know of) was at Perth, where thousands of salmon are hatched by artificial means annually. In Mr. W. Brown's admirable little book† will be found details as to the number of eggs laid down, &c. One of the consequences of this artificial hatching, Mr. Brown informs us, is as follows:—"We find that in the year 1828, the year of the passing of Home Drummond's Act, the rental of the salmon fisheries of the Tay was £14,574. It gradually fell off every year afterwards till 1852, when it reached the minimum, amounting to £7,973 5s. In 1853 the artificial rearing com-

* There is a special clause in the Act of Parliament which does away with the illegality of taking spawning fish with the net for the *bona fide* purpose of taking their eggs for the purposes of pisciculture.

* Strasbourg, Imprimerie de Venice Berger Levault, 1862.

† The Stormontfield Experiment on the Salmon. Glasgow: Murray and Son. London: Arthur Hall, Virtue and Co. Price 3s.

menced; and in 1858, when the statement was printed, the rental was £11,487 2s. 5d.; it has now reached what it was in 1828." Mr. Brown has been kind enough to send me the latest news as follows:—

"The number of ova deposited in the boxes at Stormontfield in November and December, 1862, was about two hundred and fifty thousand; in 1863 (last spawning) about eighty thousand. The reason that so few eggs were got during the last spawning season was the unfavourable state of the river for netting operations. There never was such a good show in the rearing pond since the commencement of the experiment as there is this year. Peter Marshall, the keeper, says that he has lost almost none since the hatching of the ova of 1862, and the rearing pond is at present swarming with young fry, the half of which will, as usual, become smoults in May next. None of the ova of November last have hatched as yet, the low temperature of this winter will retard them for a fortnight past the usual time.

"Croft College, Perth, 8th March, 1864."

Secondly. One of the greatest results in practical fish-hatching has been obtained by my friend Mr. Thomas Ashworth, and his brother, for they have actually peopled with salmon Loch Mask and Corrib, an area of lakes containing thirty-five acres of water. In 1861, Mr. Ashworth laid down 659,000 salmon eggs, he being, in his own words, "confident that he could breed salmon much easier than lambs." In December, 1862, he deposited no less than 770,000 salmon eggs, making in the two years 1,429,000. Mr. Ashworth tells me that the total cost of doing this has been exceedingly small. In order that the public may understand what a vast number of fish 770,000 would be, I would mention that it has been calculated by "the chronicler," Mr. James Lowe, that the number of human beings assembled to welcome the arrival of the Princess of Wales was 700,000—imagine a salmon for each human being—and you will have an idea of the number of fish Mr. Ashworth has hatched out as a stock for his fisheries. This year Mr. Ashworth informs me he has deposited 320,000 over and above Loch Mask, under the most favourable circumstances. We must wish him every success in his laudable efforts.

We must now go nearer home. About three years ago the Thames Angling Preservation Society instituted a "Sub-committee of Pisciculture," of which I have the honour to be a member, with a view to stock the river with valuable fish, by means of the artificial process of hatching. We first began by placing boxes in the meadow in the spring, but a flood, upon which we did not at all calculate, suddenly came on and endangered the eggs. Mr. Ponder and myself, therefore, determined to put up fish-hatching boxes in a situation where they would be out of danger. Mr. Ponder erected this apparatus entirely at his own cost in his own greenhouse, and he gives gratuitously his valuable time and experience to the management of the boxes, the Society paying the wages of the servants and the actual expenses incurred collecting the eggs.

During this present season Mr. Ponder has again added, at his own cost, a considerable number of boxes to his apparatus in the greenhouse, and he and I, with the able assistance of Andrew, the keeper, have been very busy the last two months collecting trout eggs from the preserves of gentlemen who have kindly given us permission so to do. The living result of our labours may now be seen in these boxes, which have become so crowded, that we have been obliged to lay some of them down in the meadow in the Christian spring. The following is a list of eggs now hatching out:—

English trout	97,000
French trout	4,800
Salmon trout	900
Great Lake trout	2,500
Ombre Chevalier	4,000
Rhine salmon	15,500
	124,700

and I hereby invite all who have heard my paper or read this report, to go and see Mr. Ponder's apparatus, at his house, Elm Grove, Hampton, about a mile from Hampton-court Station, and in the course of a few weeks will be seen over 100,000 young fish swimming about in the boxes.

During the collection of the English trout eggs I have been enabled to make many interesting remarks on the habits of spawning fish, which will be found recorded in the *Field.* I regret much I cannot mention them in this place.

The funds of the Society are not over abundant; if they were we could do much greater things. All anglers in the Thames ought, therefore, to support, by their subscriptions, our efforts to attempt to introduce salmon, ombre chevalier, and to multiply the number of trout and other fish in the Thames for the public good. Mr. Ponder and myself, moreover, in our official capacity as sub-committee of Pisciculture for the Thames Angling Preservation Society, have petitioned the Lord Mayor and the Court of Common Council of the City of London. They have been kind enough to favour our views, and to look upon our project with a favourable eye.

I will not now go into the question as to whether the salmon we turn out will return to the foul waters of the Thames. We are in hopes that when the main drainage works come into action the waters of our noble river will be clear enough for the salmon to run up—at all events, it is quite certain that if we do not turn fish into the Thames they will not be able either to run up or down; now it is most interesting to know that young smelts have been caught in smelt's nests at the mouth of the Thames, and these I have every reason to believe are of the young fish hatched in our apparatus at Hampton.

Some three years ago, Mr. Thomas Garnett, of Clitheroe, mentioned to me the possibility of making a hybrid between a salmon and a trout, and this year I have been able, luckily, through the assistance of Mr. Allies at Worcester, and the Worcester Fisheries Preservation Society, to impregnate salmon eggs with trout milt, and also to reverse the experiment, in one instance taking the small trout to Worcester alive, and there operating on the salmon eggs, and in the other bringing the ova of the salmon to London, and there operating on them with trout.

It is impossible to say what the result of this experiment will be, as the eggs have not had time to develope themselves. Should it, however, be successful, I have great hopes of obtaining a fish in which a non-migrating will be predominant over the migrating instinct. Should again these fish prove capable of bearing eggs, I would propose to cross them *again* with the common trout, so as to obtain a fish which shall be two parts trout and one part salmon. Anyhow, should my experiments this year prove worthless, I certainly intend to prosecute them again this year, as we know not where nature's law of hybridization commences and where it ends.

The observations drawn, and the results, be they good or bad, obtained from these experiments, both as regards the eggs from dead fish and the hybrids between the trout and salmon, will be recorded from time to time in the columns of the *Field* newspaper, to which I beg to refer, as it contains many articles relative to fish-hatching by myself and other observers of nature's operation.

This Acclimatisation Society, of which I am one of the honorary secretaries, being desirous to spread fish into waters where they are getting scarce, has taken up the matter, and the council have voted a sum of money for building an apparatus; the management of this they have entrusted exclusively to Mr. Francis Francis, of the Firs, Twickenham. A full account, with plans thereof, appeared in the *Field,* No. 583, February 27, 1864, from which I now quote the following particulars:—"The operation of laying the ova in the apparatus was commenced on the 24th of December last. Since that time 136,000 ova have been placed in the apparatus, and of these 40,000 have been distributed to members of the society (including a number of salmon

and sea trout ova sent to the Huningue establishment), and from 5,000 to 6,000 have perished in the process. This amount of loss shows rather a small average. On Saturday 90,000 ova and alevins (young fry) were in the trays, viz., salmon, 6,5000; salmon trout, 5,000; common trout, 67,000; great lake trout, 7,500; charr (ombre chevalier), 4,000. The great bulk of these ova have been taken for the society out of English waters, under the direction of Mr. Francis, but for the ombre chevalier and great lake trout the society is indebted to the Huningue establishment, the director of which (M. Coumes) has most generously extended as much as was required to enable the society to meet all demands in this its first season of carrying on its operations. The ova and fry sent from the society's establishment are purchased only by members at the prices fixed by the piscicultural director. These prices are for the present entirely experimental; they are fixed at the lowest rates possible. The prices vary from 40s. per thousand for trout ova, to 50s. for salmon, with an addition of from 30 to 40 per cent for fry. Vitalised ova can be sent by railway, or any other mode of conveyance; but fry require attention during the journey, and those members who purchase them are expected to send persons to the society's establishment to receive them, and convey them to their destination."

Mr. Francis would doubtless be pleased to show his mode of operation to any one who would favour him with a call.

Besides the above-mentioned public establishments there are, I am pleased to report, several private ones now at full work in various parts of the kingdom. I cannot mention all of them, but, at the same time, cannot omit those belonging to Lord Churchill, of Cornbury-park, Oxford; to the Earl of Mountcharles; to Viscount Powerscourt; to Samuel Gurney, Esq., M.P.; to Alfred Smee, Esq.; to Higford Burr, Esq., of Aldermaston-park; to T. Hall, Esq., of Farningham, to J. King, Esq., of Watford, besides several ladies (for I am pleased to see that they also have taken up the subject)* and other gentlemen. Mr. Higford Burr and Mr. Hall, of Farningham, have devised most ingenious methods of combining the indoor with the outdoor apparatus, the one using the water from a spring in his park, the other the water from a mill-head, both places showing how water otherwise idle can be made to serve a good and useful purpose. I now submit to you a detailed and carefully drawn plan of Mr. Hall's apparatus, well worthy of being adopted by all who have premises suited to the purpose.

We, in this favoured land, who have, comparatively speaking, abundance of salmon and trout, should not be selfish, but should rather do our best to give our relations and friends, now in our colonies, the benefit of "home products." You have doubtless read and heard much of the experiments of taking salmon to Australia. My friend, Mr. J. Youl, who has taken the lead in this matter—and great credit is due to him for his energy and perseverance—has given me the very last news on this important subject as follows:—Upwards of 100,000 salmon and about 3,000 trout ova were sent out to Australia in the *Norfolk*. The ova were procured from the Tweed, the Severn, the Ribble, and the Dovey rivers, thus England, Scotland, and Wales contributed to this precious freight. 164 boxes, containing about 90,000 ova, were placed at the bottom of the ice-house, with a solid mass of ice nine feet thick on the top, so that every particle of this mass must melt before the ova would suffer. Sixteen boxes, containing above 13,000 ova, were placed in other parts of the icehouse, with ice below, above, and all round the boxes. The ova were taken between the 13th and 15th January last, placed on board the ship on the 18th, and the *Norfolk* left the docks on the morning of the 21st, and Plymouth on the 28th January. Thirty tons of Wenham Lake ice were used, and I am in good hopes twenty tons will remain when the ship arrives at Melbourne, which will be on or about April 8th; we shall have news back on or about the 12th of June.

Last year I had the honour and pleasure of assisting Mr. Youl in his experiments, and we found that we could keep salmon eggs in ice (through the kind assistance of the Wenham Lake Ice Company) from periods varying from 57 to 144 days, and that the young fish would hatch out of the egg. The details of these experiments are recorded in my little book on fish-hatching.

The *Norfolk* has run from Plymouth to Australia in 71 days, and she has made this short passage no less than three times; we have therefore great hopes that the present experiment will succeed. I am sure all my audience as well as all my readers will wish this also, and that they will, both as regards this and also our former endeavours for the public good, with one accord unite in the joyful cry of "Vive la Pisciculture."

I cannot conclude this paper without reminding you of another lesson which we ought to learn, and which we should by no means neglect. The science of fish-hatching is (as I trust you will admit now that you have heard my story) both interesting as a study, and also likely to be productive of much public good. In it, moreover, we can have under close observation one of nature's most mysterious and wonderful works, which, if taken in hand by such a master-mind as that of my late lamented father (the Dean of Westminster), would, indeed, form a new and most valuable addition to the "Bridgewater Treatises," in which the "Power, wisdom, and goodness of God, as manifested in the Creation," are so ably set forth.

DISCUSSION.

The Chairman invited the meeting to discuss this paper. He might say that for fourteen or fifteen years he had been practising this fish-hatching, and could entirely confirm every word Mr. Buckland had said.

Mr. Fennell (Inspector of Fisheries) said every one present must be convinced that the country was under great obligations to Mr. Buckland for the way in which he had carried on experiments which were likely to become of the greatest use; such a man the world had long wanted. He (Mr. Fennell) had for many years past been anxious that this subject should be taken up by scientific men. He had himself been placed in a position in which he had been called upon officially to co-operate with other persons in proposing to the consideration of the legislature such regulations with regard to the fisheries of this kingdom as were in conformity with the laws of nature and the habits of the fish themselves. He had never professed to enter into the scientific part of the subject; he had had opportunities for close observation, but that was not enough. In the investigation of this question hitherto, there could be no doubt that antagonistic interests had operated to a very great extent against proper legislation on the subject of our fisheries. In an official investigation in Ireland in which he was concerned, an important question in natural history arose. The parties interested were represented by counsel, by whom the most opposite scientific theories as to the habits and properties of fish were advanced, so as to suit as far as possible the interests of their respective clients, until at length an adjournment of the investigation was agreed upon, in order that the questions raised in the course of the inquiry might be referred to certain members of the Natural History Society there. It was, however, found that they were not able to give any information with regard to the sole, the salmon, or the turbot, which would assist the Commission in coming to a decision. It was, therefore, quite apparent that scientific investigation of this subject was wanted, and they must feel greatly indebted to Mr. Buckland for the zeal with which he had come forward in this matter. It was very far from his (Mr. Fennell's) wish or intention, in the few remarks he would offer, to throw cold water upon

* See the *Queen*, January 30, February 27, March 5.

anything connected with the piscicultural movement that had lately taken place in this country, but he would refer to a few plain facts for the future guidance of those who were interested in the subject. Mr. Buckland had spoken of fish as being great cannibals, and had referred to the immense amount of destruction that took place in the ova, particularly of the fresh water species. Even those fish which did not depart from their native streams were liable to considerable destruction, but with regard to the migratory species, when they reached the sea they had to encounter enemies of the most formidable kind, and suffered still more seriously. To mention a practical fact on this subject, he would take the case of the Tay fishery, which was the most extensive and valuable fishery in Scotland. The annual catch of salmon from that fishery was of the value of £30,000, and taking the moderate calculation of four salmon as representing a value of £1 sterling, that gave a total number of only 120,000 fish—adult salmon—out of the vast number that were annually propagated in the Tay, and that yield of fish was only equal to the produce of twelve salmon of 10 lbs. weight each! They need not go further than that for proof of the immense destruction which took place, both in the spawn and young fry of this valuable fish. Allusion had been made to the fisheries of Mr. Ashworth. At the time that gentleman entered upon the occupation of his fishery, he found it in a very exhausted state, but since his occupancy he had brought up the annual catch of salmon from 500 or 600 to 14,000, and yet he began with the produce of only one pair of salmon. He (Mr. Fennell) had brought forward these facts with the view to show that if any great commercial results were to be obtained from the artificial propagation of these fish, they must be tried not only by thousands, but by millions, inasmuch as their enemies, both in fresh-water and in the sea, in the early stages of existence, were greater than could be conceived, which accounted for the very small per-centage of actual production. Upon a moderate calculation, he believed not one fish out of a hundred bred was available for use. He hoped these few observations would by no means discourage those who engaged in pisciculture, or deter others from entering into it, but the object of his remarks was to point out the extremely large scale on which the propagation must be carried out—far beyond anything hitherto attempted—to enable it to be brought to commercial importance.

Mr. Higford Burr said he had made a great many experiments on a limited scale in this direction, and was gratified to find that as far as he had gone his proceedings had met with Mr. Buckland's commendation. As far as his own experience went he could state that the system explained by Mr. Buckland answered extremely well, and with a proper amount of attention could hardly fail to be successful. He had received salmon's eggs from France, which had been transmitted in 40 hours, and also from Clitheroe, which were 72 hours in transmission. As far as his experience went the latter breed of fish were of delicate constitution, and not so hardy as the naturalised salmon trout: but he hoped to be able to rear a sufficient number to ascertain this definitely. He had tried the experiment of crossing trout with perch, and had succeeded in obtaining and hatching spawn of the grayling crossed with the pike.

Mr. Hall mentioned that at the temperature of 37° to 43° he had been very successful in hatching, and had lost but few of the young fry.

Admiral Sir Edward Belcher said the Chinese had been in the habit for a long period of rearing fish precisely in the manner described by Mr. Buckland, but they also reared frogs in the same way, and these were regarded as a very choice article of food. The catching of the fattened frogs was effected by baiting with a small frog, in the same way as a small fish was used as a bait for pike, &c. He could confirm to the fullest extent the statement of Mr. Buckland as to the great abundance of salmon in the Arctic regions. He had himself assisted in catching immense quantities of those fish there. The natives cured them, and the American whalers took large numbers away for their consumption. He found there were at least a dozen varieties of salmon in those latitudes, some being more of the trout species, others with green transparent noses, which he believed were not found elsewhere. Going further northward to the arctic circle, these fish were found in immense numbers at the mouths of all the estuaries which sent down muddy fresh water; so thick were they that in the shallow waters they could almost be caught with the hands, and this was actually done when Parry and Ross were there. Mr. Buckland had spoken of our having introduced the blue-bottle fly into some of the colonies. It might have been supposed that flies belonged to any country, but this was not the case, for when the mutineers of the *Bounty* ran away to Pitcairn's Island, they remained for some years without ever seeing a fly, and their food was safe from the attacks of those insects, but when they were visited by two frigates from England, flies were then introduced. There was a species of reptile not yet mentioned, which was very destructive to fish, namely, the fishing-snake. This reptile formed his circle round and round the fish, and then taking hold of the fore fin with his mouth, landed the fish on shore, and made it his prey. With regard to the salmon spawn being preserved in cold latitudes, he might state that as the rivers became frozen in November and remained so till May, there was a period of 181 days during which the spawn remained in the ice in those regions where salmon most abounded, so that he thought his friend Mr. Buckland need be under no apprehension as to the safety of the eggs that he had mentioned as being now on their way to Australia, packed in ice. There could be no doubt that that spawn would reach its destination in perfect safety. As a method of preserving the young fry after hatching he would suggest that a space should be allowed them in the stream where the water ran shallow, and that brushwood or something of that kind be laid down, so that the young fish might remain unmolested by their numerous enemies till they were able to work themselves out with the tide, and could take care of themselves. Means might also be taken to prevent the fish from going out into deep water in the sea. In the case of feeding and rearing trout, he thought if the water were carried from one reservoir to another, and made to tumble in its progress so as to impregnate it largely with air, it would be attended with very beneficial results to the fish.

The Chairman mentioned, as a fact of interest, that he had in his possession a letter of Sir Humphrey Davy's respecting the property of which he (the chairman) was now the owner. Sir Humphrey was anxious to hire the river for the sake of carrying out the experiments, the successful prosecution of which they had heard of this evening.

Mr. Buckland remarked, with regard to what had fallen from Mr. Fennell as to the necessity for carrying on these hatching and rearing operations on a more extended scale, it could be done by millions as easily as by thousands; it was only a question of having more hatching boxes or troughs. Following the remarks of his gallant friend (Sir E. Belcher) with respect to securing the fish on their migrating to the sea, he would say there were several large inland lakes which could perhaps be made available for the purpose, for instance, an arm of the sea behind the Chisel bank at Weymouth. The fish would then not be out of reach, and at the same time they would be protected in a great measure from their destructive enemies. With respect to what had been stated by Mr. Burr, he would add that he had received a letter from Dr. Genzick, of Lintz, Upper Austria, stating that he had succeeded in procuring a hybrid between the charr and the trout, and it was difficult to say where nature's laws in that respect began and where they ended. With respect to the rearing and breeding of frogs as an article of food by the Chinese, it appeared that several years ago the Italian Professor Spal-

lanzani bred frogs artificially by way of experiment, but he never hit off the idea of applying the process to fish, otherwise he would have anticipated the discovery of the French fishermen. He was extremely delighted to hear the statement of Sir E. Belcher, with respect to the length of time the spawn remained in ice under natural conditions in the northern regions, which strongly sustained his hopes with regard to the Australian enterprise, upon which the hopes of Mr. Youl, himself, and many others were so ardently fixed. He was also pleased to hear Sir Edward's confirmation of there being such a quantity of salmon at Petropaulouski. With regard to the fishing-snake, the hydrophis, he recommended a wide berth should be given to them, as he believed they were very venomous. Admiral Sir H. Keppel told him of a midshipman having died almost immediately after a bite in the finger from one of those reptiles, which he had caught when fishing for him with a hook baited with a fish.

Sir Edward Belcher was understood to say that the sea fishing-snake was venomous, but the fresh water species was not so.

The Chairman then proposed a vote of thanks to Mr. Buckland for his highly interesting and valuable paper, which was carried by acclamation.

The paper was illustrated by an exhibition of live salmon and trout, and also double-headed fish, and other monstrosities, by means of the oxy-hydrogen microscope, under the management of Mr. G. H. King; also by a cast of fish by Mr. Ward, and drawings and diagrams by Mr. W. H. Briscoe and Mr. Searson. The whole process of fish-hatching was shown in the room by means of the arrangement of earthenware troughs described in the paper.

Proceedings of Institutions.

Bacup Mechanics' Institution.—On the 2nd March, Mr. Benjamin Brierley, author of "Sketches of Lancashire Character," &c., read selections from his writings at the Mechanics' Institution. Mr. Kelly performed select pieces of music on the accordion. Mr. Frank Hunter presided.

Canterbury Church of England Young Men's Literary Association.—The committee, regarding the reading-room and library as most important parts of the association, have endeavoured to increase their usefulness by keeping a good supply of newspapers and periodicals in the reading-room, and by making additions, from time to time, of instructive and interesting books to the library. The number of volumes at present in the library is 1218, making an increase of 36 during the past year; the number issued was 1936. A desire having been expressed that a French class should be established, the committee appointed Mr. Maitinet as instructor, and are making arrangements for the re-opening of the class. The committee desire to express their high sense of the efficient manner in which their late secretary, the Rev. E. Gilder, fulfilled the duties of his office, and offer to him their very best thanks for his valuable services. The treasurer reports that the receipts have been £142 3s. 1d., and that the balance in hand is £47 8s. 7d.

Farnham Young Men's Association.—On the 26th February, a lecture was delivered by the Rev. Canon Carus, the Bishop of Winchester, president of the association, occupying the chair. The subject was "Science; its failures and successes." A vote of thanks to the lecturer was proposed by the Archdeacon of Surrey, and carried unanimously.

Glasgow Institution.—In the fifth annual report the directors regret that they cannot speak of an increase of students, as on every former year since its commencement. When they consider, however, the severe privations to which the working classes in several branches of industry have been subjected, they have no reason to feel unduly depressed, more especially as the attendance has really been such as still to maintain the Institution self-supporting in its own proper expenses. The numbers on the rolls of the evening and other students' classes on May 10, 1862, was 238; admitted during the year ending May 10, 1863, 508; total, 746. In the juvenile day classes there were on the rolls, May 10, 1862, 143; and admitted during the year, 99; total, 242. The total number of individuals who received instruction in 1862-63 has therefore been 988. The number of tickets sold was 1,546, exclusive of those on the rolls at the commencement of the year. The number of individuals who have received instruction in the Institution since it was founded, in 1858, has been 3,186. The numbers on the rolls for the summer season are, evening and other students' classes, 116; juvenile day classes, 129; total, 245. The average number annually for five years has been, evening classes, 686·4; day classes, 218·6; average of total numbers, 905 annually. The average length of time which scholars attend in the day classes is 2 years; of students in the evening classes, 6½ months; but as students attend irregularly, or remove before their terms expire, the real length of time they attend to receive instruction is much reduced—perhaps to an average of 5 months. Of students of branches not recognised by the Society of Arts, or too young (below 16), who came forward for Local Board certificates, 12 came forward to the preliminary examination, of whom 2 were rejected; and to the final, 10, of whom 3 were rejected. The Local Board, as inspectors of all the classes in the Institution, appointed a committee to examine such of the juvenile day classes as might be thought competent for certificates from the Local Board. 44 appeared, and to them were awarded—14 first-class certificates; 13 second; and 15 third. The financial statement shows that the receipts were £342 15s. 1d., and that there is a balance against the Institution of £48 5s. 10d. In conclusion, the directors strongly draw the attention of students to the great advantages of the examinations of the Society of Arts. They say:—"A certificate from it marks a man for life in the branch or branches certified as effectually as M.A. or M.D. marks him in the learned professions. Indeed, it would be a very great advantage to the passed candidate, if the Society would grant certain initials to those who obtain first-class certificates for a certain number of branches—say five or six."

Slough Mechanics' Institute.—The annual soirée was recently held, when upwards of 200 persons were present. The chair was taken by Captain R. B. Harvey, M.P. The proceedings were enlivened by music. Mr. Brown, hon. sec., read the annual report. The committee, after congratulating the members on the satisfactory position of the Institution, stated that the accounts showed a total of receipts amounting to £122 2s. 5d., of which £5 14s. 4d. was referable to the soirée held last year, and £23 4s. 8½d. to the rural fête in Stoke-park. The whole expenditure for the same period reached the sum of £88 9s. 9d., leaving a balance of £33 12s. 8d. in favour of the Institution. The society consisted at the present time of 13 gentlemen who paid a guinea a year, 44 tradesmen who paid 12s. a year, 50 tradesmen's assistants paying 8s., and 26 youths under the age of 18 years paying 4s., making a total of 133 members. A marked aid had been given by the continued kindness of the president, Lord Taunton, in extending the privilege of holding the annual fête in Stoke-park. 1,196 volumes had been issued from the library during the past year. From 40 to 50 members daily used the reading room. The drawing class had been very successful. In May last, the most advanced members of the class were examined by the Society on Arts. The examination resulted in eight certificates—four for geometrical and four for free-hand drawing. The examination by the Committee of Council on Education was held also in May, when seven of the junior members of this Institution passed very creditably. In November an examination was held at South Kensington, in which one student gained a first-class certificate for geometrical drawing, and two others had their certificates raised, and also gained a cer-

tificate each in building construction. The class numbered 36, with an average attendance of 28. The arithmetic class consisted of 23 pupils. There was an average attendance of 15. The lectures during the year were well attended.—The Chairman then delivered the certificates awarded by the Society of Arts, the prizes purchased with the subscriptions of friends connected with the Institution, and the certificates awarded by the Science and Art Department. A vote of thanks was passed to Mr. Chapman, to whose exertions the success of the drawing class was mainly owing. Other votes of thanks was also passed.

SOUTHAMPTON ATHENÆUM. — The fifteenth annual soirée of this society was held on the 8th ultimo, when the members of the Institution gave their earnest co-operation to the committee to produce an excellent entertainment, at which about 400 persons were present. The meeting (which was held in the Victoria Assembly-rooms) was opened by a short address by the Chairman, congratulating the members on the improved financial and useful position of the society. The band of the 2nd Hants Volunteer Rifles performed during the evening. There was an excellent collection of photographs and stereoscopes on view, and a number of antiquities, specimens of pottery, ore, china vases, coins, and ivory carvings. There were also a large number of microscopes. The comic scene, "The Haunted House," was enacted. The dramatic class gave the comedy of "Diamond cut Diamond," and the farce of "A Fish out of Water," the whole of the characters being sustained by the male members. The lady members assisted by arranging a post-office, and various other amusements were given during the evening, which appears to have been most successful.

Fine Arts.

ART EXHIBITIONS IN FRANCE.—These are multiplying on every side, in the provinces as well as in the capital. Exhibitions are now open at Bordeaux and Lyons; the *Société Lorraine des Amis des Arts* announces another at Nancy, to open on the 10th of May; Angers holds its first public exhibition in the same month, and the artistic taste of the people of that locality gives promise of considerable success; and even Melun is about to add a collection of pictures to its usual agricultural exhibition. A commission has been appointed, with the Superintendent of the imperial department of Fine Arts as its president, and the grandsons and nephew of the late Horace Vernet as members, to collect as many works as possible, not only of Horace, but of his father and grandfather, Carle and Joseph Vernet, with the view to their exhibition in the Palais de l'Industrie, in the Champs Elysées. It is expected that the number of paintings and sketches will amount to more than a thousand. Lastly, the *Société Nationale des Beaux Arts* has just opened its first exhibition, with about three hundred pictures, statues, bronzes, &c. The exhibitors' list includes some of the best artists of the day, and Gustave Doré has contributed more than a hundred works. This society is entirely independent, and presents certain remarkable features. It includes, at present, as members, about two hundred artists, besides a large body of amateur members. Each artist candidate must present a work for examination by the committee, which, at present, includes the names of Théophile Gautier, Millet, Baudry, Hébert, and other well-known artists and critics, and his election depends on their judgment; and each member undertakes to send at least one work to each annual exhibition, and is at perfect liberty to contribute as many more as he may think fit. The public forms the sole jury. The society is, moreover, an artistic club: it has its morning concerts, which have already become famous, and in the evening the rooms are thrown open for reading, conversation, music, and amusement, the only rule being that there shall be "no political discussions or personal altercations." This new society has been taken up very warmly by many persons, and some people go so far as to predict that in a few years there will be no public exhibitions upon any other plan than that above described.

SALE OF CHINESE AND JAPANESE CURIOSITIES IN PARIS.—The sale of the collection Louirette has drawn all the amateurs to the Auction Mart for several days, and extraordinary prices have been obtained. Two fine perfume burners, in incised enamel, fetched 14,000 francs (£480), and a small vase of the same character brought 3,825 francs. The rage for Chinese and Japanese art, in Paris, is also exhibited by the opening of a number of shops, one at least containing a magnificent collection of all kinds of wares; and in the adoption of the Chinese style of ornament by the manufacturers of various objects of art and luxury.

THE DELACROIX SALE IN PARIS.—The interest excited by the sale of the works of the late Eugene Delacroix has been maintained to the end—the last of the sketches having fetched enormous prices. A small pen-and-ink drawing of a man attacked by a lioness, in the artist's best manner, realised 1,000 francs; and a water-colour drawing of a horse overthrown by a tiger, 1,220 francs. The total proceeds of the ten days' sale amount to 368,079 francs—more than £14,723.

MULREADY EXHIBITION.—The example set by the Society of Arts in 1848 has been followed, with greater opportunities, on a larger scale, and in a more complete manner, at the South Kensington Museum. A collection, believed to be complete, with the exception of three pictures, of which the only important item is "The Widow" (exhibited at the Royal Academy in 1824), of the works of William Mulready, opens to-morrow (Saturday), in two of the rooms on the upper floors of the museum named. In one of the rooms are about one hundred and ten pictures in oil, the outcome, so far as the public exhibitions were concerned, of the life of the painter. The other room contains nearly one thousand drawings, comprising studies in water-colours, pen and ink, red, white, and black chalks, and pencil. A considerable proportion of the works executed in chalk are studies from the nude life—drawings which, without the chance of question or denial, are affirmed not to have been surpassed for beauty, completeness, or knowledge they display, by the productions of any masters, living or dead. One thing strikes the visitor, *i.e.*, the perfect chastity and purity of this mass of works; the figures are as pure as the spectator's mind. Some of the studies of foliage, etc., show the indomitable artist's method of working, and his extraordinary care. Among the oil pictures are some of his first-exhibited works, "The Crypt of Kirkstall Abbey" (1804), and "St. Peter's Well, York Minster" (1806). One of the interesting characteristics of this exhibition is the fact that several of the examples have not been seen publicly for fifty years. See "The Rattle" (R.A., 1808), "The Carpenter's Shop and Kitchen" (British Institution, 1809), "Boys Fishing" (R.A., 1814), a beautiful work; see also "Punch." We will now name the most important examples, in their chronological order—"The Mall, Kensington Gravel Pits" (1812), "The Fight Interrupted," "The Village Buffoon" (diploma picture at the Royal Academy), "The Wolf and the Lamb," "The Convalescent from Waterloo," "The Travelling Druggist," "The Cannon," "The Dog of Two Minds," "The First Voyage," "The Last In," "A Brother and Sister," "All the World's a Stage," "Bob Cherry," "First Love," "The Sonnet," "Train up a Child," "The Ford," "The Whistonian Controversy," "Choosing the Wedding Gown," "Haymaking," "The Butt," "Women Bathing," "The Bathers," and "Blackheath Park" (1852). The exhibition is open to the public in the same manner as the South Kensington Museum, *i.e.*, free, from 10 a.m. till 10 p.m., on Mondays, Tuesdays, and Saturdays; for sixpence, on Wednesdays, Thursdays, and Fridays, from 10 a.m. till 5 p.m.

ROYAL ACADEMY.—On Wednesday last the Royal

Academicians met and finally passed their report in favour of Lord Elcho's commission last year. It will be forthwith submitted to the Queen, and then published. It is said that the members were unanimous in rejecting the proposition of introducing lay members to advise and control the Academy in exercising its professional functions. It is the business of the painter to paint, and the layman to pay for the work if he pleases.

Manufactures.

Coal and Iron in France and other Countries.—A work on property in minerals, by M. Edouard Dalloz, was presented a few days since to the Academy of Moral and Political Sciences of Paris, by M. Wolowski, who read a report on the book in question and on various matters connected with the subject on which it treated. M. Dalloz treats especially of mineral legislation in France and Belgium, but touches incidentally on that of other nations, and also upon the statistics and economy of the mineral question in general, its bearings and influences. In connection with the statistical portion of the question, M. Wolowski was able to avail himself of more recent records than those used by M. Dalloz, and made an elaborate report to the Academy, from which the following is extracted:—In 1789 France used only half a million tons of coal a year, and of this little more than one-half was raised at home; but in 1830 the production had grown to 1,800,000, and the quantity imported to 600,000 tons. The progress made since that time is as follows:—

	Production. Tons.	Importation. Tons.	Consumption. Tons.
1835	2,500,000	800,000	3,300,000
1840	3,000,000	1,290,000	4,290,000
1845	4,000,000	2,200,000	6,200,000
1847	5,400,000	2,500,000	7,600,000

During the four following years political events stopped the growth, both of production and consumption; the quantity raised in France fell back to four millions of tons, and the imports to little more than two millions. Since 1852 the progress was great and constant—

1853	5,900,000	3,500,000	9,400,000
1854	6,000,000	4,000,000	10,000,000
1855	7,400,000	5,000,000	12,400,000
1856	7,900,000	5,000,000	12,900,000
1857	7,900,000	5,195,000	13,095,000
1858	7,353,000	4,840,000	12,200,000
1859	7,483,000	4,900,000	12,400,000

In 1860 came the change in the tariff, and the following are the results to the present time:—

1860......	8,391,000	5,200,000	13,600,000
1861......	8,400,000	5,300,000	13,700,000
1862......	9,400,000	5,200,000	14,600,000
1863......	10,000,000	5,200,000	more than 15,000,000

The return for last year being an approximate estimate made by the Imperial Administration of Mines. By these figures it will be seen that France raises for herself at present as much as she consumed in the whole of 1854; and that the consumption itself has doubled since 1847. It will be observed also, a fact not noted in the report, that since 1860 there has scarcely been any increase in the imports, while the home production has grown about 20 per cent. Side by side with these facts M. Wolowski drew special attention to the fact that the quantity of coal brought to the surface in England had grown from twenty-six millions of tons in 1837, to eighty-four millions in 1862, and that she produced far more than the half of all the coal raised in the world. The produce of America was given at fifteen, that of Belgium at nine, and of Germany at upwards of fourteen millions of tons per annum. As regards iron, the whole of the furnaces in France only produced 69,000 tons of pig iron in 1789, 115,000 tons in 1812, and 112,500 tons in 1819. Since that time there has been a great increase, and it is important, says M. Wolowski, to see what has been the effect of the commercial treaty of 1860. In 1830 the quantity of pig iron had risen to 347,773 tons and that of wrought iron to 237,379 tons, and in 1847 it had grown to 602,772 tons of the former and 376,686 of the latter. In 1848 the totals had fallen off to the extent of 50 per cent. No reaction occurred till 1854, but in 1859 the totals were 856,000 and 520,000 respectively, rather less than those of 1858, and considerably below those of the previous year. During the years 1860-1 a great increase took place, and in 1862 the amount of pig iron produced rose to 1,053,000 tons, while that of 1863 is estimated at 1,180,000 tons. Of the last total, says M. Wolowski, 280,000 tons were charcoal iron, the remaining 900,000 tons having been produced with the aid of coal alone or mixed. As regards wrought iron the report gives the following return for the year 1863:—

	Tons.
Charcoal iron..................................	76,800
Coal iron	606,000
Mixed fuel..	22,700
Total	705,000

The production of charcoal iron has fallen in the last three years from 90,655 to 76,800 tons, while that of coal iron has risen from four to six hundred thousand tons. In 1847, more than half the iron produced in France was charcoal iron. The total product of all Europe in 1808, according to M. Héron de Villefosse, was only 825,000 tons of pig iron, while the quantity now made is about seven millions of tons, of which England produces nearly four; and in 1862 France, 1,180,000; Germany, 591,593; Sweden, 143,000; Austria, 270,000; and Belguim, 161,000 tons. After such totals as these it is curious to note that in 1740 England made none but charcoal iron, and only produced 17,500 tons in the year.

Metric System of Weights and Measures.—Mr. Ewart's Permissive Bill for the introduction of the metric system into this country passed the second reading in the House of Commons on Wednesday, by a majority of 90 to 52. Mr. John Bennett, in a letter to the *Morning Star*, says:—"How strange it is that, though the value of the decimal system is well understood on the Continent, its adoption should still remain uncared for by our Parliament! As a watch and clock maker I have to lament the failure of our productive powers in competition with the French, the Swiss, and even the Germans. They beat us by their better system of education, which throughout Switzerland is universal, gratuitous, and compulsory. Another great element of their success lies in their enlisting the delicate and patient fingers of their female population. But with these advantages their superiority would not be so complete if they had not everywhere the practical benefit of an uniform metric system of weights and measures as the only legal standard for guidance in their manufactures. The manufacturer of watches in a Swiss village can thus act through orders he may send for a few pence by telegraph to workmen and workwomen, at their own homes, a hundred miles away from him, for by the decimalised metric standard every workman can set his tool with such mathematical precision that the part upon which he is engaged cannot fail to fit in the machine which is laid down in corresponding sizes. Thus our rivals have a great advantage over us, in a more minute subdivision of work, in the ability infallibly to hit off dimensions with such exactness that they want no cobbling into shape in order to fit them for their work; and, lastly, the manufacturer is in a position to select the best hands, whether they live far or near from the spot where his central operations are carried on."

The British Horological Institute offers a prize of thirty guineas for the best "Treatise on the Detached Lever Escapement and its Varieties." To fulfil the

object of the prize-donors, it is desirable that the treatise should embrace the history of the various improvements in the "Lever Escapement" to the present time, pointing out the advantages said to be obtained by each, together with practical directions for securing the action sought by the inventor. It should also treat of the subject generally, giving tables of proportions of the various parts for the ordinary constructions, and explaining the effects of vibration in these proportions. It is also extremely desirable that the procedure followed by an expert escapement maker, in making a first-class escapement, should be clearly described. To make the essay still more practically useful, it should notify to the examiner the points to be especially tested and the best means of rectifying any discovered error. Various tools for effecting the several measurements, and for facilitating the completion of the escapement, should also be described. The text would be more readily understood if illustrated by simple diagrams. The competing essays must be delivered in, on or before the 3rd September, 1864. The Prize-Fund has been raised by subscription, and there will be three judges—two of whom have been nominated by a majority of the subscribers, viz., W. Hislop, Esq., F.R.A.S., and A. Walsh, Esq., M.Inst.C.E., and the third is to be nominated by the authors of the essays.

Commerce.

Preservation of Meat.—The preservation of meat, whether for the use of our sailors on board ship, or for other purposes, has long engaged the attention of scientific and practical men, and various ways of effecting this object have been from time to time devised. The methods hitherto adopted on a large scale have been the packing of cooked meat in air-tight cases, or impregnating it with salt and keeping it in barrels immersed in brine. The first, though effectual for preserving the meat for almost any amount of time, leaves the flesh, even when the utmost care is taken in the process, more or less insipid and tasteless; the second, though also preservative for a considerable time, renders the meat not only flavourless, but absolutely extracts from it, as Liebig tells us, nearly all its nutritive properties, as well as those peculiar qualities which are necessary for keeping the body in health. It is well known that a long continuance of such food, thus prepared, engenders scurvy. The Admiralty are now making experiments with a process devised by Dr. Morgan, an Irish gentleman; and a few weeks since some animals were slaughtered, and their carcasses subjected to this process in the presence of officers of her Majesty's Victualling Department at Deptford. A bullock having been killed in the usual way, the chest was immediately opened, and a metal pipe with a stop-cock inserted in connection with the arterial system. This pipe was connected, by means of elastic tubing, with a tub filled with brine placed at an elevation of about twenty feet above the floor. The stop-cock being turned, the brine forced itself through the arteries of the animal, and, passing through the capillaries, flowed back through the veins, carrying with it all the blood, making its exit by means of an incision provided for that purpose. About six gallons of brine passed thus through the body, washing out all the blood from the vessels. Having thus cleared all the vessels, the metal pipe was connected with another tube similarly placed, containing the preservative materials to be injected, and at the same time their exit, after traversing the body, was prevented. On communication being made, the liquid became forced into the vessels, and, by means of the pressure, it penetrated into every part of the animal, and might be seen exuding at any point where an incision was made. The liquid used on the occasion of the late experiments consisted of six gallons and a half of brine, 10 lbs. of sugar, $\frac{3}{4}$ lb. of saltpetre, with half a bottle of catchup and an infusion of cloves and pepper. The whole process is very rapid, and is extremely simple, requiring nothing that can be termed machinery. It took no longer than three minutes to send the first six gallons of liquid through the animal to wash out the vessels, and about three minutes more to inject the animal with the preservative liquid. Indeed, so rapid is the whole proceeding, that, even on the occasion above referred to, where the men were unaccustomed to the work, and the arrangements were necessarily imperfect, the time occupied was only twenty minutes from the killing the animal to the complete infiltration being made. The beast is then skinned, cut up into pieces, large or small, as may be required, and taking to a drying room, where it is hung until thoroughly dried, after which it is packed in boxes with sawdust and charcoal. It is confidently believed that the meat treated in this manner will stand any climate, and the flesh is free from the insipidity of that ordinarily preserved in tins, and its goodness is not destroyed by having nearly all its valuable properties drawn out by immersion in brine. So far as its preservative powers have been tested in this country, the process is stated to answer the purpose. A purveyor at Portsmouth has for some time past treated meat in this way with success, and sells it in the regular course of trade. It is obvious that any variety of liquids, chemicals, or condiments may be thus injected into the animal, and the meat flavoured in any way that may be thought desirable; the meat may also be dried or cured like ham or bacon, if so wished. Indeed, it would seem that the method is peculiarly fitted for this purpose. In hot countries, and in countries where animals are abundant, and where now they are bred almost entirely for their wool, fat, and hides, the process seems especially valuable, as by it the meat, instead of being thrown away, might be rendered available for export for food to other countries. The Victualling Department have had a few animals thus prepared for experiment, and it is intended to send the meat out on voyages to various parts of the world to test its keeping qualities. So little machinery is required, that a ship's crew could readily carry out the process at any place where they could land and animals were abundant, and thus lay in a store of meat which, although, no doubt, salted to a certain extent, would not have the same disadvantages in a sanitary point of view as meat preserved in brine-pickle. Some lengths of india-rubber tubing, pieces of metal tube with stopcocks, and tubs for holding the liquid, are all that is required. In hot climates the drying may be effected in the open air, and in other cases there would be no difficulty in arranging a room for the purpose, either on shore or on board ship.

Cotton in Paraguay.—The cultivation of cotton in Paraguay last year has actually exceeded in extent that of tobacco, one of the principal staple products of the Republic; and there is every reason to believe that the plant will be still more generally grown in the present and future years. Intelligence had arrived that the samples of Paraguayan cotton sent to Manchester had been valued at a good price, and been pronounced to be of fair quality; and there can be no doubt that a knowledge of this fact will have a stimulating influence upon the agricultural classes of that country. The movement is being warmly promoted by the Government, and praiseworthy efforts are being made for the distribution of seed and the dissemination of information.

Colonies.

Flood at Melbourne.—A flood occurred about the middle of December last, which is admitted to be the most formidable visitation of the kind which has been experienced since the foundation of the colony. Melbourne was entirely surrounded by water. The Yarra rose in some places fully 50 feet; in other parts, where the banks are low, the river disregarded its natural sinuosities, and rushed along, a turbid torrent. At Prince's Bridge the

Yarra is ordinarily about two chains wide. During the height of the flood the water extended from the Suburban Railway on the one side to the Immigrant's Home on the other, a distance of about a third of a mile. The southern approach to the bridge was completely hid in water, which dashed over the roadway like a cataract. All the low land, bounded by the city, Emerald Hill, and Sandhill, was hid in one large sea, and the water was up to the eaves of every house and store in that locality. Emerald Hill looked like an island, and the road to Sandridge could be traced only by the tree and fence tops. Traffic had to be suspended for several days on the Hobson's Bay Railway, and people who had business between the city, and Emerald Hill, and Sandridge, had to be conveyed to and fro by boats. Stores and warehouses were under water, and publicans had to establish lines of boats to avoid loss of custom. Steamers and sailing vessels, though ready to leave harbour, had to remain at the wharves, because the flood would not allow the Yarra to be traced, and the works of the Melbourne Gas Company were inundated, and, in consequence, the city was in partial darkness for several nights.

TASMANIAN FURNITURE.—The *City of Launceston*, which was to leave for Melbourne on the 15th December last, took, amongst other cargo, the first shipment of Tasmanian-made furniture which left the port of Launceston. It consisted of about seventy packages of chairs, tables, &c., all made of Tasmanian woods, chiefly light-wood, and produced at a steam manufactory. A hope is expressed that this venture will meet with success, and be the means of opening up a new branch of trade with the neighbouring colonies.

THE "LIGHTNING ROCK" (VICTORIA), so named from the circumstance of its discovery, will not probably be much longer dangerous to inward or outward-bound vessels passing through the "Rip." The *Victoria* has lately been employed in the work of its removal, so far, at least, as to put it beyond the bounds of possibility that ships of even the very heaviest tonnage should strike upon it under any circumstances. So great a mass of the rock has already been removed by blasting as to render it harmless, but it is intended that the operation shall be continued until a great deal more of it has been detached from the main body, which has many fathoms of water upon it, even in the lowest tides.

CROWN LANDS AT MELBOURNE.—A series of sales of Crown lands were held in Melbourne during the month of December, consisting of town, suburban, and country lands in various districts of the colony, which have at most times found ready purchasers at prices mostly in advance of—and in many instances at rates considerably above—up-set prices. Amongst other lots offered were sections of land at Echuca, the crossing place of the river Murray, on the confines of the colony of Victoria and the ultimate terminus of the Government railway. The prices obtained will give some idea of the importance of the locality with a view to future business sites. The total amount realised was £13,788 6s. 1d., of which £8,913 was the proceeds of 47 acres 1 rood 19 poles of town allotments; £1,746 13s. 5d. the return for 634 acres 1 rood 14 poles of suburban lots; and £3,128 12s. 8d. the produce of 2,682 acres of country lands.

A NEW MINERAL, says a Melbourne paper, has been discovered in the neighbourhood of the Upper Yarra. The mineral resembles that well known as sapphirine, and is harder than topaz, which it scratches. It will be principally valuable for the lapidary, polishing other stones, &c. Although it has as yet only been found in the portion of the colony above referred to, it is likely to be met with wherever the granite formation predominates.

NATAL.—This colony is making rapid strides. The year's crop of sugar is estimated at 3,000 tons, and the prices are now such as to put the growers into high spirits. The increase in the number of banks has materially reduced the price of money.

Correspondence.

VERIFICATION OF OLIVE OIL.—SIR,—In the very able paper read by Mr. Tomlinson, on the 2nd instant, great stress was laid on the importance of chemically clean water being employed, the success of these experiments on cohesion figures depending mainly on the absence of any organic deposit which would spoil the surface contact. And I should be led to infer that chemically clean water, by a parity of reasoning, was equally important, but he previously stated that the ordinary water, such as supplied by the New River Company, was sufficiently pure for the purpose. I recollect, some few years since, submitting samples of water from various sources to microscopic test, that of the New River amongst them, and the result showed minute organic matter in large quantities, especially in those portions taken from the stream near town. I should think it probable that in such a case, on the contact of the drop of oil, there would be a local attraction of such organic matter which would in some way disturb or influence the character of the figure. In an experiment in which so much depends upon the delicacy of manipulation, would it not be better to filter and distil the water so as to ensure its purity as far as possible? I would also beg to suggest to any member who may enter on these experiments, and possess the apparatus, the employment of the oxy-hydrogen microscope—a very high power need not be used. By these means I think a series of experiments might be conducted which would result in a definite classification of cohesive figures, which could not fail to be interesting to scientific, and useful to practical society.—I am, &c.,
MOWBRAY WALKER.

STEEL TUBES BY COLD DRAWING.—Sir,—My attention has been called to an article in your *Journal* of the 4th instant, on the new method of producing steel and other tubes by cold drawing, which attributes to a Frenchman the introduction of this system some nine years since. I claim your indulgence, in order to correct the misapprehension to which this statement may give rise, in not distinguishing more clearly between what has been and what is now the process of manufacture. The patentees of the new machinery claim to have first applied hydraulic power to the drawing of tubes in any metal. The brass and copper tubes that have hitherto been drawn solid have been so drawn by steam power, and over a mandril the length of the tube. A method of producing tubes in which hydraulic pressure is employed was introduced some years since by a French patentee, but in this instance (the only one with which I am acquainted) a disc of metal was taken and cupped up so as to form first a saucer, then a basin, and gradually, by pressure on the bottom, a tube with one end closed; by opening this end the tube was completed. The many difficulties of this process are readily seen, and I believe it has never been made of commercial importance. By the new method eight or more hollow castings of steel, or three times as many of brass, can be drawn at once over a bulk-headed mandril, and through a die surrounding it, so as to reduce them to any degree required, improving the metal at each pass. The machine erected will draw eight 3-in. tubes in steel. The patentees claim, 1st. The machinery by which these tubes are produced and trued. 2nd. A method of cold-welding them together. 3rd. Of drawing tubes of any length over a mandril. (This has been tested to the extent of fifty feet in steel.) 4th. Of producing tapers of any size or section. The whole by cold solid drawing. There are, of course, many small details, important in their bearings on these results, but with which I will not occupy your space, as any of your readers shall have every facility afforded them for viewing the machine in operation, on applying to the Secretary of the Hydraulic Drawing Company, as below.—I am, &c.,
G. P. HARDING.

3, Bank-buildings, E.C.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Society of Arts, 8. Cantor Lectures, Mr. W. Burges, "On Furniture."
R. Geographical, 8½. 1. Dr. C. Forbes, "Notes on the Physical Geography, Climate, and Mineral Resources of Vancouver's Island." 2. Lieut. Palmer, R.E., "The Upper Waters of the Fraser and Peace Rivers, with remarks on the Gold Fields of British Columbia."
British Architects, 8.
Medical.—Clinical Discussion.
R. Academy, 8. Mr. R. Westmacott, R.A., "On Sculpture."

Tues. ...Civil Engineers, 8. Mr. G. H. Phipps, "On the Resistance of Bodies passing through Water" (concluding part).
Statistical, 4. Annual Meeting.
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Prof. Marshall, "On Animal Life."

Wed. ...Meteorological, 7.
Society of Arts, 8. Mr. G. R. Burnell, "On the Organisation of the Corps Impérial des Ponts-et-Chaussées in France."
London Inst., 7.

Thur. ...Royal, 8½.
Antiquaries, 8.
Linnæan, 8. Mr. A. R. Wallace, "On Variation and Geographical Distribution, as illustrated by the *Papilionidæ*."
Chemical, 8. Sir Benjamin Brodie, "Theory of Organic Peroxides."
Philosophical Club, 6.
Numismatic, 7.
Royal Inst., 3. Prof. Marshall, "On Animal Life."

Fri. ......Philological, 8.
Royal Inst., 8. Prof. Tyndall, "Contributions to Molecular Physics."
R. United Service Inst., 3. Lieut.-Col. A. C. Robertson, "The Art of Command considered with reference to the duties of Regimental Officers."

Sat. ....Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 20th and 22nd February, 1864.

49 (1). Navy (Labour Charts for Dockyards and Steam Factories)—Return.
59. General Committee of Elections—Mr. Speaker's Warrant.
36. Convicts—Return.
43. East India (Loan)—Return.
44. East India (Revenues)—Return.
51. Railway Trains (Redhill)—Returns.
52. Casual Poor (Metropolis)—Return.
53. Bank of England—Annual Accounts.
19. Railway and Canal, &c., Bills (13. London, Brighton, and South Coast Railway (Additional Powers), New Lines in Battersea); 14. London, Chatham, and Dover Railway (No. 1); 15. London, Chatham, and Dover Railway (No. 2), (New Lines, &c.); 16. London Main Trunk Underground Railway; 17. London Union Railways; 18. Metropolitan and Saint John's Wood Railway; 19. Metropolitan District Railways; 20. Metropolitan Grand Union Railway; 21. Metropolitan Railway (Additional Powers), (Notting-hill and Brompton Extension), (Trinity-square Extension); 22. Midland Railway (Saint Pancras Branch); 23. North London Railway (Additional Powers), (Kingsland and Tottenham Line); 25. Tottenham and Farringdon-street Railway; 26. Tottenham and Hampstead Junction Railway (Extension to Charing-cross); 27. Victoria Station and Thames Embankment Railway; 28. Walthamstow, Clapton, and City Railway)—Board of Trade Reports.
23. Bills—Penal Servitude Acts Amendment.
27. ,, Cattle Diseases Prevention.
28. ,, Cattle, &c., Importation.

Session 1863.

Delivered on 19th February.

Census of Ireland for the Year 1861—Report and Tables, Vol. 1. (Part 4).

Delivered on 23rd February, 1864.

45. Army (1862-63)—Statement of Savings and Deficiencies.
66. Trade and Navigation Accounts (31st December, 1863).
19. Railway and Canal, &c., Bills (24. Oxford-street and City Railway; 29. Aberystwith and Welsh Coast Railway; 30. Alford and Mablethorpe Railway; Alton, Alresford, and Winchester Railway; 31. Anglesea Central Railway; 32. Aylesbury and Buckingham Railway; 33. Bedford and Cambridge Railway; 34. Belfast and Northern Counties Railway; Belfast, Ballymoney, and Ballycastle Junction Railway; 35. Blackpool and Fleetwood Railway; Blockley and Banbury Railway; 36. Blyth and Tyne Railway (Additional Powers) (New Works); 37. Bourton on the Water Railway)—Board of Trade Reports.
25. Bills—Land Drainage (Provisional Orders).
26. ,, Inclosure.
Convict Discipline and Transportation—Further Papers.

Delivered on 24th February, 1864.

8. Irish Reproductive Loan Fund—Account.
22. Telegraphs (India, Singapore, and Australia)—Return.
25. Court of Chancery—Return.
58. Bullion—Return.
63. Augmentation of Benefices—Return.
64. Theatres (Precautions against Fire)—Return.
71. Bullion—Return.

Patents.

From Commissioners of Patents Journal, March 4th.

Grants of Provisional Protection.

Artificial fuel, cylinders used in the manufacture of—390—H. W. Wood.
Bacon, manufacture of—361—A. and E. M. Denny.
Boots, shoes, &c., manufacture of—362—J. Keats and W. S. Clark.
Boots, shoes, &c., uniting the soles and uppers of—368—T. White.
Braiding machines—380—T. Jackson.
Bread making, superphosphates for—360—J. H. Johnson.
Brewing utensils—322—W. R. Taylor.
Buildings, &c., fire-proof—376—W. Riddle.
Cement, manufacture of—414—H. Y. D. Scott.
Chandeliers, lamps, &c., manufacture of—104—J. Rennie.
Cranks, apparatus for forging, &c.—356—R. Smith.
Doors, &c., rendering water tight—395—W. C. Fuller.
Envelopes, letters, &c., fastening and securing—2704—J. H. Brown.
Fabrics, apparatus for tentering, &c.—382—W. Whiteley.
Fibrous materials, machinery for preparing, &c.—384—W. Anderton.
Filters—364—J. Slack.
Garments, &c., attaching buttons to—394—H. and J. Andrews.
Gas purifiers, hydraulic valves for—156—J. Wilson.
Grain, apparatus for drying—374—W. Southam.
Hydraulic presses, pumps of—412—W. Hawkins.
Iron, manufacture of—372—W. Drake.
Land, apparatus for cultivating—392—W. Hensman.
Parasols, &c.—410—J. Weeks.
Photographic apparatus—363—P. A. L. de Fontainemoreau.
Power-looms—378—W. Norton.
Railway signal—405—W. Hobbs.
Railways, permanent way of—398—W. Clark.
Smoke, apparatus for consuming—195—R. A. and E. Wright.
Steam apparatus for ships' use, &c.—370—W. Winstanley and J. Kelly.
Steam engines—400—A. J. Joyce.
Sulphuric acid, manufacture of—358—G. Davies.
Threshing machines—366—J. David.
Windows, apparatus for cleaning—396—J. E. Tuchet.

Inventions with Complete Specifications Filed.

Artificial granite, &c., manufacture of—488—W. E. Gedge.
Spine-bags—504—J. Chapman.

Patents Sealed.

2202. S. Gerish and J. Weston.
2203. L. Mond.
2206. W. A. Wilson and J. Smith.
2207. J. Burch.
2209. R. A. Brooman.
2210. W. Hewitt.
2220. E. T. Hughes.
2229. J. H. Wilson.
2231. W. W. Greener.
244. H. Crichley.
2251. D. S. Sutherland.
2253. H. Riviere.
2282 P. Cowan.
2367. G. Spill, T. J. Briggs, and D. Spill.
2447. A. Johnston.
2256. H. Clayton.
2892. E. C. Nicholson.
3066. W. Firth, S. Firth, and J. Sturgeon.

From Commissioners of Patents Journal, March 8th.

Patents Sealed.

2232. H. Wright, J. W. Wright, and W. Clough.
2236. J. Hartshorn & W. Redgate.
2238. L. Desens.
2240. J. Rhodes.
2242. J. Dobbie.
2246. J. Crellin.
2247. J. King.
2260. C. Battock.
2262. W. Thompson.
2272. B. J. Webber.
2380. J. T. and E. Harlow.
2450. E. Leek.
2504. G. Mountford.
2651. T. Grason.
2746. H. Bessemer.

Patents on which the Stamp Duty of £50 has been Paid.

526. G. Smith and J. Carrick.
534. T. Haigh and R. A. Robertson.
541. S. Botturi.
543. E. Sabel.
572. G. Eskholme.
569. H. A. Silver and H. Griffin.
579. T. W. Evans.
604. J. Hirst, jun., and J. Hollingworth.

Patents on which the Stamp Duty of £100 has been paid.

667. C. Lungley.
729. H. Bridges.
730. J. P. Oates.
824. S. Fox.
663. R. M. Ordish.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, MARCH 18, 1864. [No. 591. Vol. XII.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at 8 o'clock.

March 23.—Passion week. *No meeting.*

March 30.—"Artificial Light and Materials Used for Lighting." By B. H. Paul, Esq.

Cantor Lectures.

The concluding lecture of Mr. Burges's course will be delivered on Monday next, at eight o'clock.

Mar. 21.—Lecture VII.—The Weaver's art; Mediæval, Eastern, modern.

Six lectures on "Chemistry applied to the Arts" will be delivered by Dr. F. Crace Calvert, F.R.S., F.C.S., corresponding member of the Royal Academy of Turin, of the Société Industrielle de Mulhouse, of the Société Imperiale de Pharmacie de Paris, &c., on Thursday evenings, at 8 o'clock, as follows:—

March 31.—Lecture I.—Bones.—Composition of raw and boiled bones. The manufacture of superphosphate of lime. Application to agriculture. Bone-black or char, and their use in sugar refining. *Phosphorus*, its properties, extraction and employment in manufacture of matches. *Horn* and *ivory*, their composition and applications.

April 7.—Lecture II.—Gelatine, Glue, Bone-size Chondrine, their preparation, chemical properties, nutritive value, and application to arts and manufactures. Artificial tortoiseshell. *Isinglass*, its adulterations and adaptations to clarification of fluids. *Skins* and the art of tanning.

April 14.—Lecture III.—Leather.—The art of the currier. Morocco, Russia, and patent leathers. The art of tawing skins. Chamois and glove skins. Parchment. *Hair*, its composition and dyeing. *Wool*, its washing, scouring, bleaching, and dyeing. *Silk*, its adulterations and conditioning.

April 21.—Lecture IV.—Animal Fatty Matters, the various processes for liberating them from the tissues in which they are contained. Their composition and conversion into soap. Composite candles. The refining of lard. *Cod-liver*, *sperm*, and other oils. *Spermaceti* and *wax*.

April 28.—Lecture V.—Flesh, its chief constituents, boiling, roasting, and preservation. *Animal black*, its manufacture and applications. The employment of animal refuse in the manufacture of *prussiate of potash*. *Prussian blue*. Manufacture of artificial animal manures.

May 5.—Lecture VI.—Animal Liquids.—*Bile*, its purification and detergent properties. *Blood*, its application in the refining of sugar and the manufacture of albumen. *Albumen*, its use in calico printing and photography. *Urine*, its uses. *Milk*, its composition properties, falsification, and preservation. A few words on putrefaction.

Dwellings of the Labouring Classes.

The Council have passed the following resolutions:—

"That a Conference of the Society be summoned to consider the causes of the present unsatisfactory condition of the Dwellings of the Labouring Classes, and what remedies can be advantageously adopted."

"That, besides inviting the attendance of any members of the Society taking an interest in the subject, the cooperation of such as are members of the Legislature as well as of the Presidents of the Institutions in union, be especially requested."

"That the Chairman of the Council, Lord Henry G. Lennox, M.P., Mr. Marsh, M.P., Mr. Cole, C.B., and Mr. C. Wren Hoskyns, be a committee to make the arrangements for the Conference, and to invite thereto any other persons whose presence they may think desirable."

Proceedings of the Society.

CANTOR LECTURES.

Fine Arts Applied to Industry. By W. Burges, Esq.

Sixth Lecture, Monday, March 14.—Furniture.

The lecturer said, that under this very comprehensive title he would not confine himself to what is generally understood by furniture, but would enlarge upon the general decorations of the interior of our domestic buildings. He first of all called attention to the way in which this matter was arranged in the 13th and 14th centuries, showing from the extracts of the public records, published in "Parker's Domestic Architecture," how the ceilings were boarded and painted; and how the walls afforded endless subjects for the invention of the artist, while the better sort of furniture was also historiated with colour and gold. Some curious extracts, from Guillabert de Metz, and Vasari, were brought forward to show what were the domestic arrangements of the 15th century in France and Italy, the first extract being the description of a citizen's home in Paris in 1409, and the latter containing a long account of the works of Dello Delli, who was especially famous for his paintings on furniture. The next portion of the subject was the various modes in which articles of furniture could be ornamented. Thus, if the wood be made to show, it can be inlaid with marquetry, buhl, mother-of-pearl, ivory, or be partially covered with more valuable wood, or have ornaments in the metals, in marbles, and enamels. Again, when the wood is intended to be entirely covered, it can be decorated with various sorts of gilding, as in the coronation chair at Westminster; or have paintings in certain parts, as in the presses at Noyen and Bayeux; or it can be painted and

covered with varnish, like the Japanese work. The lecturer then observed that, although it was impossible for any one man to give the age a distinctive architecture or a new and picturesque costume, yet in his own house he could do completely as he liked, and if his rooms were furnished in bad taste the fault must rest with himself. A series of suggestions then followed for the decoration and furnishing of our rooms, great stress being laid upon the desirability of giving some sort of decoration to our flat white ceilings, and of substituting wall paintings for paperhangings. The practice of filling the windows with one immense piece of plate glass, thereby depriving the house of all scale on the outside, and giving the room a cold appearance from the inside, was also reprobated; and several suggestions put forward respecting the treatment of the floors, and of the furniture generally, moveable divans being recommended instead of the multiplicity of sofas and chairs. A few words on ecclesiastical decoration concluded the lecture, attention being especially called to the beautiful stalls at Amiens, and more particularly to the treatment of the moulding and carving. There were some very excellent specimens of furniture exhibited by the more prominent decorators and upholsterers. Thus, Mr. Crace contributed an oak cabinet, with a brass grille, designed by the late Mr. Pugin. Messrs. Trollope sent an ebony cabinet in the cinque-cento style; while several articles, more particularly a table in purple wood, were due to the courtesy of Messrs. Jackson and Graham. Mr. C. Seddon contributed an escritoire in oak, decorated with marquetry, from the designs of his brother, the well-known architect, besides several chairs; and Mr. Ellis, of Bedford-street, a curious example of the employment of natural foliage (ferns, &c.) in the decoration of panels. There were also one or two specimens of furniture painted after the manner of the thirteenth century by modern artists.

Fourteenth Ordinary Meeting.

Wednesday, March 16th, 1864; G. F. Wilson, Esq., F.R.S., Member of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Nelson, Thomas James, Guildhall, E.C.
Parsey, Samuel, 77½, Little Britain, E.C.
Stanford, Edward C. C., 63, Lincoln's-inn-fields, W.C.

And as Honorary Corresponding Member.
Romake, Joseph, Admiralty, Trieste.

The following candidates were balloted for and duly elected members of the Society:—

Benham, Edward, 18, Essex-street, Strand, W.C.
Boxell, Thomas, 43, King's-road, Brighton.
Greig, Robert, 33, The Cedars, Putney, S.W.
Martin, Claude, Park-cottage, Acton, W.
Parry, Robert Seaton, Balham Hill, Surrey, S.
Robinson, S., 60, Church-gate, Stockport.
Ruddock, Samuel, 22, Bloomfield-terrace, Pimlico, S.W.

The Paper read was—

ON THE ORGANISATION OF THE CORPS IMPERIAL DES PONTS-ET-CHAUSSEES, IN FRANCE.

By George R. Burnell, Esq., C.E., F.G.S.

As England is approaching the time when the services of the state are destined to be more or less centralised, it seems to me necessary for those who are charged with the superintendence of the various offices of the government to acquaint themselves with the principles upon which foreign nations have organised the bodies to whom they have entrusted the peculiar duties connected with the various branches of the administration. There is, too, a tendency on the part of some of our statesmen of the present day to praise everything that emanates from the French government, particularly with respect to the administration of public works; and as the Corps Imperial des Ponts-et-Chaussées is the most important body that the Minister of Public Works employs upon them, it seemed to me that it would afford the subject of an evening's discussion that would be fraught with interest to you, were I to relate succinctly that which I know with respect to the organisation of that body, and of the education that the members of it are obliged to go through.

The public works of France constitute the object of a separate department of the administration of the country, under the control of a minister, who is responsible to the Emperor for the manner in which he discharges his duties. These consist of the maintenance and the perfection of the means of internal communication, both by land and water; the providing for the safety and convenience of the traffic with foreign countries, by the docks, river navigation, the lighthouses, and beacons of the coast; the works that are undertaken for the improvement of agriculture, such as draining and irrigation works, &c.; the mining operations (by the way, these operations are conducted under the superintendence of a special body of engineers, called the Ingénieurs des Mines, with respect to the organization of whom I read a paper at the meeting of the Royal Cornwall Polytechnic Society, in the month of September last); the conditions that are to be observed with regard to the exercise of unhealthy and dangerous trades; the working of steam engines; the erection and maintenance of the buildings of the state, beyond those that are comprised within the functions of the other ministers; but in many cases the Ingénieurs des Ponts-et-Chaussées enter into the service of the State under the different branches of the administration, as *en service détaché*. The Minister of Public Works has also to prepare and propose the laws for the regulation and control of private commerce; for the encouragement of arts, so far as they are affected by the processes of manufacture. He has the control of the industrial schools, the fund for the superannuation of government employés, the savings banks, the joint stock companies, the private banks, and the superintendence of the service of weights and measures. He is also charged with ascertaining the changes in foreign legislation on the subjects that are likely to interest French commerce, and it his duty either to publish them, or to send them round to those that may be affected by them; according to the regulations that prevailed some time since, he had the superintendence of the general statistics of France, and of the government stations for breeding horses. In the discharge of these duties he is assisted by the Ingénieurs des Ponts-et-Chaussées, for all that relates to the services that come within their functions: thus there is a Direction of Roads and Bridges, that is charged with the service of the highways, and the departmental roads, and with the police of the traffic upon them. There is a Direction of Navigation, that is charged with the service of the ports and the canals, with the rivers, both navigable and floatable, understanding by the latter word such as are capable of floating down timber, but are not suited for navigation, either on account of their velocity, or their shallowness, or irregular volume; with the police of these rivers, and with the arrangements for their improvements. There is a Direction of Railroads, divided into two sections; of which the first undertakes the regulation of the lines and their concessions; and the second undertakes the works, and the direction of the working of the railroads, and the collection of the statistics of that means of locomotion. The Minister is assisted by the Ingénieurs des Mines in their department, but they are immediately under the orders of the secrétaire-général of that body; in the other branches of his duties the minister is assisted by a numerous staff of officers that relieve him of the care of the details, and allow him to concentrate his attention upon the broad principles involved in the policy he himself is disposed to carry into effect. It is probable that in the rapidly

changing system that now prevails in France, some portion of the duties that are above enumerated, as, for instance, the superintendence of the horse-breeding establishments, may be withdrawn from the functions of the Minister of Public Works, Agriculture, and Commerce; but the list given of the minister's duties was the correct one some time since, and it contains, at any rate, a correct statement of the functions that the French authorities considered to fall within the limits of that officer's occupations.

The Administration des Ponts-et-Chaussées, it is thus seen, forms one of the most important branches of the service of the Minister of Public Works, and is organised in the most systematic manner, according to the French point of view, to secure the effective discharge of the services entrusted to it. The date of the creation of this body is rather remote, and it is another illustration of the manner in which the *Ancien Régime* had prepared the way for the Revolution. As far back as the time of Henry IV. there existed, in fact, a government body of engineers, under the direction of the Grand Voyer of the Kingdom. Louis XIV. gradually increased the power of these engineers; and in 1722, the Regent instituted the Corps des Ponts-et-Chaussées, under its present name, and with nearly the same functions that it has at the present day, for the purpose of executing the system of public works that France had then determined upon. MM. Trudaine, father and son, were the heads of this organization, and they were succeeded by Perronnet, in the direction of the Ecole des Ponts-et-Chaussées at any rate, about the year 1750; at the same time the local governments of Languedoc and Bretagne established their separate bodies of engineers, on the same footing as that of Paris for the rest of the kingdom. In 1791, the Constituent Assembly passed a decree, maintaining the organization of the Ponts-et-Chaussées, but they introduced into it the system of management that now prevails, and they only recognized one school for it, viz., that of Paris. There have been some changes, without importance, since that period, as in the years 1804, 1817, 1836, 1839, 1853, 1855; but substantially the organization of the administration remains the same as it had been settled by the Constituent Assembly. The acts that have been referred to only made some alteration in the ministry that they were under, and a little difference in the authority of the sous-secrétaire d'état that was specially charged with the direction of the united bodies of the Ingénieurs des Mines, et des Ponts-et-Chaussées.

The minister, then, under the present system, approves the projects of the new works submitted to him in the regular course of his business, and those of the great repairs of the roads, bridges, canals, and harbours; he sees to the regularity of the contracts that are taken; he divides the credits allowed by the legislature; and he prepares the decrees regulating the position of the engineers from the 2nd class, observing in all cases the regular system of promotion, unless there be some very peculiar circumstances connected with the case. The directeur-général has the superintendence of the correspondence with the préfets of the various departments and the engineers; he presides over the meetings of the conseil-général in the absence of the minister; and he prepares all the details of administration that the minister is required to sign. The conseil-général is composed of the engineers of every degree that may be present at the time in Paris; it is presided over by the minister; in his absence, by the directeur-général, or by an inspecteur nominated for the purpose by the minister. It has to pronounce upon the projects and plans of works, and all the questions relating to construction that may arise; upon the questions of accounts, and upon those that concern the legal rights of the state, arising out of the property that it has in the works executed; and, finally, it decides the questions that are connected with the duties of the engineers, that would have to be brought before the council of state or the minister; for in France no person in the employ of the government can be prosecuted for the acts that he may commit in the course of the discharge of his duty, however gross they may be, without the permission of the conseil d'état, before whom the actions that may arise must be tried.

The whole of France is divided into eighteen districts, each of which is under the inspection of an engineer, who receives the title of inspecteur-général de 2nde classe; the inspecteurs-généraux de 1re classe being honorary members, and without any definite functions. The inspecteurs are obliged to visit their districts every year, for the space of three months, and they render an account to the conseil-général of the state in which they have found everything in the course of their visit, either with regard to the composition of the staff, the manner in which the accounts are kept, or the conditions they may observe to prevail in the works, such as the roads, bridges, rivers, canals, harbours, railways, factories, ferries, drainage operations, &c. This report must be prepared on paper that allows the engineers in charge of the various parts of the public works to append their remarks to it; or rather the latter have to make a report that is transmitted to the conseil, approved and commented upon by the inspecteur; the reports of the latter class of officers, however, that relate to the staff of engineers, are sent directly to the minister, on account of the confidential character of the communications. The service of the departments is divided between the ingénieur-en-chef de 1re classe and the ingénieurs-en-chef de 2nde classe; the ingénieurs-ordinaire de 1re, 2nde, et de 3me classe; and the conducteurs faisant fonctions d'ingénieur-ordinaire, or of the various brigades of the officers of that rank. The ingénieur de 1re classe is charged with the preparation of the projects for the improvement of his district; the demand for, and the opening of, credits; the execution of works either by competition or by régie, which means that the state employs the workmen and engages the tradesmen to furnish materials on its own account; the number of people employed in the offices; the payment of the accounts, and the delivery of the certificates and orders upon the treasury; the direction of the law proceedings; and the movement of the *employés* of the office. The ingénieur-ordinaire presents to the ingénieur-en-chef the accounts of the measurement of the works executed, and the various conditions of the reception, and the state of those works; he is also charged with the examination of the projects that it may be considered advisable to undertake, which are then submitted to the ingénieur-en-chef, and by him are transmitted to the ingénieur-inspecteur, to be by him co-ordinated with the general projects for the whole kingdom. The ingénieurs-ordinaires are likewise charged with the duty of following the inquiries before the local authorities, into the propriety of establishing certain trades in the localities, that may give rise to questions *de commodo et incommodo*, as the French style the questions that are connected with the establishment of unhealthy trades, and the regulation of the lines of buildings on the public roads; the police of the roadways is also within the jurisdiction of the ingénieurs-ordinaires, who are, however, obliged to conform to the orders they may receive from the higher authorities in these matters. It is the duty of the ingénieurs-ordinaires to see that the various contractors execute their engagements with the State in the strictest manner, and they must personally superintend the measurement of the various accounts they certify; they are assisted in the performance of their various duties by the conducteurs, who may, on some occasions, be promoted to the fulfilment of the office of ingénieur-ordinaire; but the rule of the promotion in the Corps des Ponts-et-Chaussées is very much opposed, as we shall see hereafter, to the irregularity of this movement of the last-mentioned body of men; they only are allowed to perform the functions of engineer, whilst they remain conducteurs to the end of their lives.

The ingénieurs des Ponts-et-Chaussées are admitted into that body in the following manner, that is never de-

parted from, let the candidate for distinction display ever so much knowledge that would become useful in the profession of a civil engineer. The candidate for admission must first of all prove himself capable of going through the examination of the Ecole Polytechnique, and if he support that ordeal, he must study in that school for the space of three years, passing through the examinations that the pupils of the école are subject to every year. He then, after going through another examination, proceeds to the special school of the Ponts-et-Chaussées, where he follows a course of education that is considered to be such as to qualify him to practise as a civil engineer. He has to go through various repetitions and preliminary examinations, that in their variety of subjects, and the profundity of the scientific information that they require, would sorely puzzle the English engineers in the majority of cases; and finally, at the end of three years, the candidate is allowed to pass the final reception, and to be classed as an aspirant-ingénieur, or an ingénieur de 3me classe. The pupils who go through the last examinations with particular distinction are sent abroad to study the peculiarities of foreign practice; and when they return their notes are published, for the most part, in the "Annales des Ponts-et-Chaussées." They are then sent with their colleagues to the various places that may be in want of an engineer; but their special talent is hardly considered in the choice of their pursuit, either in their first nomination or in their subsequent promotion, which follows the regular steps, and leaves little room for the display of original talent of any kind. The consequence of this organisation of the school is that the young men leave it with a vast amount of undigested knowledge that would enable them to pass the examinations in the various branches of their profession; but they rarely possess any practical knowledge whatever. "They are," as M. Etex said in his lectures "On the Fine Arts applied to Industry," "capable of anything and fit for nothing;" and the fact that their promotion in after-life depends upon the mere principle of their seniority, tends very much to perpetuate the sort of feeling which the pupils of the Ecole des Ponts-et-Chaussées have when they leave that institution. This may be said to be a perfect self-satisfaction with themselves, such as always accompanies the possession of theoretical, as contrasted with practical, knowledge, and a contempt for all who may not be so well acquainted with the class of information that they have been enabled to obtain; and there is this peculiar disadvantage attending the kind of preparation for the future exercise of their profession that the young men who leave the Ecole des Ponts-et-Chaussées are exposed to, that they are obliged to rely greatly upon the conducteurs of that body for all that may relate to the practical details of the pursuit.

When the Ecole des Ponts-et-Chaussées was first instituted, in 1747, by M. Trudaine, on its present footing, and Perronet was appointed director of it, the class of education was more general and more decidedly practical than it is now; and the consequence of this was that the productions of the first engineers of the Ponts-et-Chaussées were characterised by much greater taste than those of their successors. It happens in France, and has been observed to take place in England, that the new inventions and the new processes that are introduced into the building trade are all of them of a nature to require the knowledge by those who employ them, of the powers of resistance of materials; and as architects are seldom disposed to study the scientific part of their profession (which would be required in the case of these new processes), it follows that the engineers are always consulted when they are to be employed. The inconvenience of the course followed in the education of young engineers is beginning to be felt in the supreme ugliness that they give to the monuments they are called upon to design; and there are serious questions whether it would not be worth while to change the system of education, in order to introduce some principles of taste, such as had marked the productions of the earlier engineers. Perhaps this might be effected, if the knowledge of free-hand drawing from the figure were made an essential part of the course of examination, and proof were required of the attendance of the pupils at courses of lectures in architecture and archæology; but this is at any rate certain, that the engineers of the Ponts-et-Chaussées invariably spoil the opportunities that are afforded them to erect civil buildings, and that the various bridges that they are employed to execute are very deficient in the monumental grandeur that characterized the productions of Huppeau, Pitrou, Perronet, Chezy, Lamblardie, De Prony, &c. This is, after all, a question that interests the lovers of æsthetics, and may for the time be set aside, the more especially as the tendency of everything that is happening in England and America is towards the same state of indifference to the effect of the great works entrusted to the engineers; provided the works satisfy the conditions of stability that are required in them, the public seems contented to set aside the consideration of their beauty in France as well as in England; and the accusation against the engineers of the Ponts-et-Chaussées, that their productions are deficient in taste, must, at any rate, be shared by their colleagues in other countries that pretend to as high a state of civilization as France.

The engineers, however, after leaving the school, are sent, as was said, to the place that may be vacant, whatever the nature of the occupation may be there; they are then promoted, as was before said, in the order of their seniority, unless there be some very strong grounds for making an exception for or against them. They are expected to observe towards one another the kind of respect that is always observed in a military organization, and to exact the same respect from their subordinates; so that the conducteurs are always treated with the same kind of distance with which an officer would treat a common soldier. There are three kinds of service—the service ordinaire, the service extraordinaire, and the service détaché. Of these, the service ordinaire comprehends three classes—the service général, that includes all the ordinary kinds of works that fall within the duties of the Ponts-et-Chaussées; the service spécial, that embraces the direction of the works that are separated from the state budget, and are paid for by the departments; and the service desconseils généraux, that comprehends the general administration of the body, and the service of the Ecole des Ponts-et-Chaussées, and of the depôt of maps and plans. The service extraordinaire includes the superintendence of various works that are paid for by the state, but do not enter into the ordinary occupations of the engineers; such as the service of the lighthouses, the works against inundations, the reclamation of the Sologne, &c.; whilst the service détaché comprehends the works that are executed for the departments of the state that are not included in the budget of the Minister of Public Works; such as the harbours of Brest, Cherbourg, L'Orient, Rochefort, Toulon, the colonies, the expeditions to foreign countries, Algeria, and the municipal service of Paris, Lyons, and other large towns. The salaries paid to the various grades are—for the inspecteurs-generaux de 1re classe, 12,000 francs per annum; of the 2nde classe, 10,000 francs per annum; ingénieurs-en-chef de 1re classe, 6,000 or 5,000 francs per annum; of the 2nde classe, 4,500 francs per annum; ingenieurs-ordinaires de 1re classe, 3,000 francs per annum; ditto of 2nde classe, 2,500 francs per annum; ditto of 3me classe, 1,800 francs per annum; the pupils of the Ecole des Ponts-et-Chaussées receive 1,200 francs per annum, and when they are employed on mission they receive 1,800 francs. The engineers are, besides their salary, entitled to charge their office expenses, which are fixed by the minister; but, with this exception, and the exception of some works that the engineers are allowed to undertake for the account of the communes, they are strictly limited to the appointments allowed them by the government. I can myself vouch for the fact that the engineers, notwithstanding the

moderate amounts of these salaries, are almost universally pure and honest, in the noblest degree; they scorn to receive bribes; and the tone of morals that prevails amongst them in all that relates to pecuniary affairs might serve as a useful lesson to ourselves. This is, perhaps, aided by the conviction that they cannot be discharged from their functions, or debarred from their promotion, unless under very peculiar circumstances of misconduct. They have also a retiring pension in their old age, and their position in society is about the highest in the French administration, from the esteem and respect that always attaches itself to the possession of the class of knowledge that they must attain. The influence of the money-making tendency of the age may be detected, perhaps, in some cases, but generally speaking, every one that has had occasion to know the ingénieurs des Ponts-et-Chaussées must bear the highest testimony to their profound sense of honour and delicacy of feeling.

One great cause of the efficiency of the service of the engineers is, however, to be found in the body of conducteurs, or clerks of the works whom they employ, and who are engaged upon the field operations, the superintendence of the workmen, the measurement of the works done, and the preparation of the drawings that are sent out from the engineer's office. The nomination of these men is rather singular, and takes place somewhat after this fashion:—The engineer receives a young man into his office, without salary at first, and he brings him up to the details of his business; at a certain time the men present themselves for examination as conducteurs, and they become embrigadés if they can pass that ordeal, which is made to embrace the whole range of sciences that are concerned with the practice of civil engineering, such as geometry, the theory of numbers, logarithms, the drawing of plans, levelling, taking out quantities, measuring work, the superintendence of it, and generally all that would be required for carrying works into effect. They become then conducteurs embrigadés de 4me classe, and they pass through the ranks of the third, second, and first classes, in the order of their seniority generally; but they may mount in grade more rapidly, in proportion to their merit or their patronage. By the law of 30th October, 1850, it was provided that the sixth of the places of the engineers should be reserved to the conducteurs that had been in the service for the space of ten years, and who could then pass the examination that the engineers were subjected to; but this provision has hitherto been perfectly nugatory, for since its promulgation there has not been a single promotion from the body of conducteurs. The utmost they can aspire to is to be allowed to perform the functions of a civil engineer, whilst they retain their old rank. They would be regarded as intruders if they forced themselves into the society of engineers, as the equals of the latter, by taking advantage of the letter of the law. The consequence of this state of affairs is, that the pupils of the Ecole Polytechnique have practically the monopoly of the government employment in the place of the Ponts-et-Chaussées, for the conducteurs do not aspire to that title, let them be ever so learned or ever so capable; and thus the French revolution has perpetuated the inequality of conditions, by giving the monopoly of the profession to those that can afford to pay for the education that is given in the schools—a strange commentary upon the doctrines of equality that the revolution was intended to inaugurate.

There is a very great inconvenience arising from the strictly theoretical style of education that the young engineers are called upon to go through, that consists in the desire the bulk of them possess to distinguish themselves by the construction of works of a monumental character, without any regard to the conditions of economy that would be applicable in the majority of cases. The principle of the French law is that the architect is responsible for the solidity of the building that he may put up, against any defects of construction or erection, for the period of thirty years; and though the Ingénieurs des Ponts-et-Chaussées do not come under the strict application of the law, owing to their not working for a commission, yet the tendency of the law is to produce a great degree of strength, and a solidity of execution, that may be traced in all the works they execute. The administration requires, in addition, that no work should fail; the engineer that risks much is looked upon as a dangerous and troublesome man. There is every inducement, therefore, for the engineer to erect "monuments," and the character of the works of the Ponts-et-Chaussées is marked with the grandeur and the magnificence that was formerly the distinguishing mark of the Roman engineers; but the cheap and expeditious systems that prevail in England and America are regarded with dislike and contempt. One other objection may be made to the French system, in the total absence of original thought that it developes. The best subjects, as they call them, are obliged every year to travel in foreign countries, and the works that are done in France are generally the productions of civil engineers and the somewhat despised race of architects. The Ingénieurs des Ponts-et-Chaussées do not attempt to produce any new style— they only seek to construct "monuments" that shall last for ever regardless of cost. The tendency of the body of the Ponts-et-Chaussées to this style of work is also, to a great extent, assisted by the publication of the journal of the body, that appears about six times a year, under the name of the "*Annales des Ponts-et-Chaussées*," and is characterised by the excessive love of theory, and the abuse (if I may say so much) of mathematical and other scientific knowledge, that may be reproached to the whole of the present school of French engineers. The members of that profession who communicate the information that is inserted in this journal, are, in fact, obliged to treat every subject which they undertake in the most abstract manner, as though they constructed or designed works for the sake of resolving problems of science, instead of endeavouring to answer the questions that might arise, with the purpose of constructing the works economically; they cultivate science as the end of their labours,—they do not look upon it as the means to the end. The same observation may be extended to the bulk of French scientific works, whether they be brought out by the Ingénieurs des Ponts-et-Chaussées or by the ingénieurs civils, for the latter are obliged to follow the example set by their rivals, and to employ a great amount of science on the simplest operations of their pursuit. Yet there is a great advantage in thus substituting the indications of theory for the rule-of-thumb processes that are still too prevalent here; and the contrast that is presented between the French engineering journals and the English productions of the same kind, is but little to the credit of our scientific and practical men.

The ultimate consequence of the strict system of promotion that prevails in France is, that all that relates to the general direction of the public works of that country is obliged to be transacted through the body of the Ponts-et-Chaussées; and the civil engineers are there reduced to the rank of conductors of the industrial establishments, that are still allowed to be free from state control, although the civil engineers have proved themselves to be capable of directing the railways and other public works, with at least equal ability with their more fortunate rivals. The railways seemed, for a time, to be destined to form an exception to the general body of the works, for the late Mr. Locke and the English contractors were entrusted with the execution of the Paris and Havre and the Cherbourg lines; but it was found that the relations between the Minister of Public Works and the company were so numerous, and they comprehended so many questions which involved the rights of the Ponts-et-Chaussées to interfere with the working of the railways, that even upon these lines the government engineers have been employed. Indeed it is difficult to imagine any other course being long adopted in France; the whole service of that country is so despe-

rately centralised that the intervention of the State is felt in all things. Thus, the body of the Ponts-et-Chaussées, being always upon the spot, is necessarily employed in making the surveys for the lines of railway, roads, and canals, that may be thought necessary; and the organisation of that body provides it with ample means of carrying out the projects that it conceives. It may be that the nation gains in the unity of views that is thus produced, and that many cases of competing lines may thus be avoided; but this advantage seems to me dearly purchased, when it is only obtained by the annihilation of the private enterprise of the whole country, which is the inevitable result of the French system. It has been pretended that the estimates that are prepared by the French engineers are better and more trustworthy than those that are made by their English brethren, and that a contractor would be more inclined to risk his fortune on the French preliminary surveys and estimates; but if we set aside the greater facilities that the French engineers have for making their calculations for the works that they are employed upon, the superior correctness of their estimates in works that are at all out of the common run may be very much questioned; and certainly they design their works in a manner that English engineers would consider to be very extravagant, owing to the traditions that prevail in the body of the Ponts-et-Chaussées, who pride themselves rather upon not considering the commercial view of the question in their constructions. It is, however, to be observed that much of the merit that is thus due to the engineers of the government is owing to the admirable system upon which their accounts are kept; and the merit of the "comptabilité" that forms, so much and so justly, the boast of the engineers is, after all, due to the conducteurs, whom the regulations of the body consign to perpetual inferiority. The engineers, in fact, content themselves with the duty of organising the manner in which the estimates and the definite accounts are to be prepared; they leave all the details to be worked out by the conducteurs, who fill the position of the Soodras in the "hierarchy" in which their chiefs play the part of the Brahmins. There is much more truth than appears at first sight, in this comparison with the Indian social arrangement, for the classes that are thus formed in the French body politic are as strictly defined as those of India, and there is nearly as much difficulty in passing from one rank to another. The distinction between the ingénieurs des Ponts-et-Chaussées and the conducteurs is, however, a permanent and ineffaceable one, that will always be a standing reproach to the system that would prevent a man from rising by his own merits to the foremost ranks of his profession.

Yet, although I am myself fully aware of the inconveniences of the French system of organising the public works of that country; though I know the great expense that the nation is put to on account of the want of practical knowledge, and from the deficient technical education of the engineers that the government is obliged to employ, from the fact that no man can there rise from the ranks, let his merits be ever so great, and from the mania that the system fosters for constructing monuments that should last for ever; yet I have seen such confusion and such waste occasioned by the system that prevails in England, especially in the appointment of government officials in similar matters, that I should be almost inclined to prefer the French system of the Ponts-et-Chaussées to the ignorance and incompetence that prevail here in government offices. The engineers of the Ponts-et-Chaussées are thoroughly acquainted with the subjects they have to pronounce upon, and they all feel as though the reputation of their body were entrusted to their safe keeping; whilst in England the nomination of the engineers of the government is entirely regulated by favour and caprice. Fortunately, the influence of the authorities that are appointed by the state is very small in England, for we still retain so much of the independence of habits and modes of thought that are the essential characteristics of local self-government, that the engineers named by the government can do little; but if the circumstances should change, and if the influence of the central government should be increased, it must become a serious question with us, whether the organization of the Ponts-et-Chaussées, that does not admit the nomination or the advancement of the favourites of the minister of the day, may not be the best that can be devised in the interest of the ratepayer. In a highly-centralized government, like that of France, the organization of the Ponts-et-Chaussées no doubt produces excellent results. It would be out of place here, as long as we retain our self-dependence and that love of true equality, that enables any man to rise according to his own merits; but it is the best system that has yet been thought of for securing the talent of the men and the independence of their judgment from the theories or the passions of the moment. There are several details in the organization of the service which might easily be altered (as, for instance, the fact that the engineers are only responsible for the acts that they may do in the discharge of their duty to the *Conseil d'Etat*, and the fact that the conducteurs cannot rise to the superior ranks of the profession), but, with these exceptions, there seems to be no reason why something like the organization of the Ponts-et-Chaussées should not answer very well with the gradual tendency to the development of centralization that is so manifestly gaining ground amongst ourselves. It would secure for the public at least the services of educated engineers, and put a stop to the curious nominations that we have sometimes witnessed in our public offices; added to which advantage would be the incidental one of raising the tone of the profession in matters connected with their own emoluments, which recent events have shown to be very low in England. Perhaps there is something that is opposed to the English notions of government in the existence of a body that is composed of officials, who are not in any way liable to the influence of the ministers of the day, either for their nomination or for their advancement, and there may be danger in thus creating a body that should have the control of the funds of the nation to the exclusion of the rest of their profession, and to the perpetual interference with the ingenuity of the great body of the public; but this is counter-balanced by the advantage of the absence of the influence of the minister. There is, of course, the disadvantage of having to do with a board of theoretical men, who are likely to insist upon the observance of the strict scientific conditions that they conceive to regulate their pursuit, as was the case with the Ingénieurs des Ponts-et-Chaussées in the matter of the rate of the inclines for railways, which they for a long time insisted should be made with an inclination of 1 in 200, when the English engineers had proved that they might be executed at 1 in 60 without inconvenience. This is a drawback that will always attend an organized body of such a nature; but there must be set against it the advantage that this body procures in controlling the action of the government in the details of the practical application of the science. The minister is, indeed, quite powerless in cases which strictly belong to the carrying out of works that may be ordered; the Ingénieurs des Ponts-et-Chaussées alone can regulate the manner in which they are to be executed. The fact that the Ministry of Public Works is a political appointment, and therefore is subject to the caprice of the parliamentary government, throws a great power into the hands of the Ponts-et-Chaussées, who are always in possession of the influence which they may derive from their position as distributors of government patronage, and as executing the works that the state may, through their advice, undertake; and this they have shown that they know how to use for securing their independence.

It is desirable here to mention that the course adopted

in the execution of public works in France is for the Minister of Public Works to submit to the legislature a project of law for their establishment, if they are of a nature to require a concession from the state, or to give rise to a large advance of public funds, or if they should require the application of the law of expropriation; in other cases, they may be the subject of simple ordinances, as in the case of municipal or departmental works. The projects for all of these undertakings must be accompanied by drawings, specifications, and estimates, which must be approved by the conseil that is specifically concerned in their execution, and they give rise to the production of a mass of papers and reports that are produced for them, and which are themselves perfectly bewildering. The worst of this method of entrusting the public works to the care of the state is that there is no security that they shall be finished if once begun, provided the state be in want of funds, or it should have been found advisable to appropriate them to other uses. This last contingency has, it may be observed, already happened in several remarkable cases. For instance, the breakwater of Cherbourg, which cost the total sum of £2,400,000, had been mounted by the simple interest of the money during the time that it was in hand, to the sum of £8,400,000. The cost of the canals had been just tripled by the interest that had accumulated upon the sums invested in them before they were inaugurated throughout their length. Besides this there is always the danger and difficulty of the works being executed in an official manner, that gives rise to the inconvenience of reports and reference to the various offices of the state, in case there should be any reason to change any of the details of the system that may have been agreed upon at the first conception of the scheme. All the questions must be decided in the Conseil des Ponts-et-Chaussées of Paris, and, setting aside for the moment the absence of local control that must thence ensue, there must be a tendency in that body to impose their own style of work and their own modes of thought. In the cases of the works that are conceded to large public companies it might be supposed that the admistrations of the latter would have sufficient power and influence to reduce the interference of the body of the Ponts-et Chaussées to their legitimate bounds, but in all the concessions hitherto given there is left so wide a margin for the action of this body that they are practically all-powerful. The works are to be executed to their satisfaction, and they have a control over the workmen, the materials employed, and the manner in which the work is executed, so that they can stop the companies at any stage of their progress. Hitherto the force of public opinion has kept the engineers within the bounds of what may be considered their duty. It remains to be seen what will be the effect of this system when it is applied to a country fully accustomed to centralization, and debarred from the control of a free press, such as France is at the present day. The tendency of what is now passing in that country is to introduce the control of the engineers independent of the ministers of the day; to establish the system of the monopoly of classes that is perpetuated by the necessity for the pupils passing through the Ecole Polytechnique; and by the exclusion of the conducteurs and the civil engineers, to concentrate the money and the patronage of the state entirely in the hands of the engineers of the Ponts-de-Chaussées. I think this must eventually prove to be a wrong policy, though it certainly tends to raise the character and position of the engineers; and that France will, sooner or later, find herself, in this respect, in the trammels of a system of castes that will effectually destroy all originality of thought and action.

DISCUSSION.

Mr. Haywood (Engineer to the City Sewer Commission) said he did not gather from the paper that Mr. Burnell held any conclusive opinion as to whether the system in France was better than that in England, or the reverse. With a great deal Mr. Burnell had said he fully concurred, but the root of the whole question of the organization in this country of a corps corresponding to that of the Ponts-et-Chausseés lay in the political condition and habits of the people. Whether it would be desirable or not, there was little probability of its being done in our time. He must confess that being tolerably well acquainted with France and her institutions, he never went there without regretting that some system could not be established in this country by which more unity of action in engineering matters could be obtained, especially with regard to the metropolis; but he could not see any intermediate condition between the present local-government system and the institution of a corps somewhat similar to that of the Ponts-et-Chaussées. If that corps was tested by the grandeur of its works, it was far in advance of the English; on the other hand, if the results were tested by the activity of commercial enterprise, then the French system was far behind ours. They had then to choose between the two. With regard to the works of the engineers in France, his conclusion was that their aqueducts, docks, high roads, and canals, were laid out better than our own, and also that the workmanship in them was superior to ours. With regard to the originality of their works he did not feel he could give an opinion. As to their scientific investigations he was inclined to place a higher value upon them than Mr. Burnell had done. Undoubtedly the first series of engineering publications he was acquainted with was the *Annales des Ponts-et-Chaussées.* He knew nothing in this country approaching them, and they formed a scientific literature of which any nation might be proud. There was one thing he could fully endorse,—that was the very high tone of honour amongst the engineers themselves. Their official pay was exceedingly small, but he believed a body of men with a higher professional tone did not exist. They did not aim at acquiring large fortunes, inasmuch as scientific men generally got in France that which they could only obtain here by becoming wealthy—they got high honour and social position. He happened to be at the New Year's levée of the Emperor, and he then inquired what was the precedence of the Corps des Ponts-et-Chaussées on such an occasion. He was told that the engineers took rank before colonels in the army, which was an evidence that their standing was fully acknowledged. But that was not the case in this country. There were brilliant exceptions, such as Faraday, and some others who, although they never sought for wealth, were still so distinguished that they could not be overlooked; but the great mass of professional men in this country were generally measured by the depth of their pockets. That was why they struggled to make money as quickly as possible, because money was the passport into society. The engineers of the Ponts-et-Chaussées had an entirely different tone of feeling. He knew many of them personally, and could speak of them in the highest terms. There was one remark in the paper about the architects which struck him. He understood Mr. Burnell to state that they were responsible for what was called the well-designing of their work for a period of thirty years. The period was a long one, but he thought it would be a wholesome thing if some such rule were acknowledged in this country. It was true, a man was responsible for what he did, because, if he did not perform his duty, remedy might be had against him at law; but most persons would rather bear the loss than have recourse to the remedy. Then, again, the French system had its disadvantages. All those who practised as engineers in that country must have gone through the Ecole Polytechnique, and thus have been in some measure educated by the State, and so became naturally subject to State control. After all he felt that he could not say with certainty which system he preferred, there were so many elements involved in the question; but he would say he never went to France without coming back bitterly regretting that our present system did not, with our huge wealth and great commercial enterprise, produce results more worthy of the

nation. If a few remarks on a subject, now becoming one of great interest in this country, were not out of place, he would say a few words as to the system of subways formed in Paris, which would serve as an illustration of the great care with which such works were carried out in France. His remarks would apply to Paris, Lyons, and other large towns. In the whole of the internal arrangements of those towns the French were beating us hollow: they were building better houses, forming better thoroughfares, putting up better lamp-posts, giving more light, and in all arrangements which affected the health of the community they were considerably in advance of this country. With regard to the main sewers of Paris, they were built in a style of magnificence which might be expected from a body who were not limited as to expense. He was one of those who thought the public works of large cities ought to be monumental, and not merely for the present generation. Surely it was an unworthy feeling that it was sufficient to carry out works which would last our own time, and to leave posterity to take care of itself. That was part of the money-greed of the age; and in that respect our public works contrasted unfavourably with those of Paris. The large intercepting sewers of the French capital were made with footways on each side. Those along the Rue Rivoli and the Boulevart-Sebastopol were so large that a full-sized man could walk on the footway on either side with his hat on, so ample were the dimensions of these sewers. They were kept in a state of cleanliness that was surprising. The entrances were made highly ornamental, which he thought superfluous; the steps which led down to them were wide enough for two persons to descend side by side. A railway ran along the edge of each of the footways of the large sewers, and below that was the invert forming the sewer proper. An exceedingly well-devised apparatus travelled up and down this railway, and mechanical scrapers were used by which the bottom of the sewer was constantly cleansed. The whole of the gas and water pipes were covered with a black varnish or bituminous compound; it was true there were leakages, but very few. The smaller branch sewers were most of them six feet in height, and on each side of them might be seen porcelain figures marking the house drains, with a small piece of white enamel about an inch square, which indicated that the proprietor of a particular house paid three francs annually for keeping his private drain clear. Everything was carried out on the same scale. When they contrasted this with the way things were done in London, without entering into the political question, with which he had nothing to do, but looking simply at the material results as they were presented in the capital and large towns of France, it made us ashamed on looking at our own metropolis; and when one knew as much about the expenditure in London as he did, as compared with the wealth, he must come to the conclusion that there was no town in France in which the inhabitants relatively to their means spent so little in keeping their city in decent and proper order as they did in London.

Mr. E. C. Tufnell remarked that the direction of the observations just made was altogether to depreciate English engineers below the French. He did not agree with that position, because there were many facts which went in contradiction of it. When the French desired to introduce any new engineering practice they almost invariably came to this country for the assistance of engineers. When railways were first commenced in France they sent for Locke and other English engineers to carry them out. We were the first country to introduce suspension-bridges. The French sent a deputation to this country from the Ecole Polytechnique to inspect what we had done; they returned to France, issued an elaborate report, stating that our suspension-bridges were erected upon wrong principles, and devising (as they thought) better ones. They erected a suspension-bridge in Paris on their principles, but immediately upon its completion it tumbled down. Then, again, with regard to the Suez Canal, notwithstanding the predominance of French influence in Egypt, the Pacha sent to this country for engineering advice with regard to that project, and Mr. Hawkshaw went out to that country to make a professional report upon that great undertaking. Looking at these facts he could not at all reconcile them with the views expressed by Mr. Haywood.

Mr. Frederic Lawrence did not feel the same difficulty that Mr. Haywood felt, as to which system he preferred. As an Englishman he approved of a system which allowed talent to develop itself—by itself—rather than a centralised system which tended to cramp the energies and fetter the originality of those employed; and he thought if they compared the engineering works of this country with those of France, looking at the works themselves, they would see at once that our system was by far the best. Could the French engineers point to a Britannia Bridge? or if they had anything resembling it did they not copy it from us? Was not every large engineering work in France a copy or modification of something previously done in England? He was surprised to hear Mr. Haywood speak so approvingly of the sewers of Paris. It might be that the sewer along the Rue Rivoli was better than anything we have in London, but why was it better? Because the French engineers came over here and saw what we had done: they adopted what we had done well, and improved where they felt they could improve. It was, however, only recently that sewers had been introduced into Paris, and if that system were carried out all over the capital—as was stated regardless of expense—Paris might eventually be a better drained city than we could boast of. With regard to some of the details, he did not think Mr. Haywood, with whatever staff he could command, would care to have put upon him the task of fixing up the tablets he had spoken of, in the city sewers, indicating the numbers of the drains, and the sum paid by each private individual to have his drain kept clean. He had no hesitation in saying that, in his opinion, however admirable an institution the Corps of Pont-et-Chaussées of France was, it bore no comparison with the engineers of England; because, when he looked round, he saw the names of engineers who had carried out works which the Corps of Pont-et-Chaussées dared not have attempted. He therefore differed from Mr. Haywood, and had no hesitation in pronouncing the English engineers the first in the world; for, when any country was in difficulty, England was applied to for that valuable engineering counsel which could be obtained from no other country.

Mr. Haywood explained that his remarks had been misunderstood. He had dealt only with the broad features of the paper, and he had made no comparison between English and French engineers, as regarded their professional skill.

Mr. Lawrence understood Mr. Haywood to refer to the question of the two systems, and they must judge from the results whether one was better than the other.

Mr. Burnell said he had carefully guarded himself in what he had said against drawing comparisons between English and French engineers. Upon the question of the relative merits of the two classes it was a singular fact that the French engineers had almost invariably consulted the English, and all the inventions that had altered the face of engineering science had arisen either in England or America. With regard to railways it was well known they originated in England, and the same thing occurred with reference to suspension bridges. The merit of that form of bridge they knew belonged to Telford. Steamboats, the electric telegraph, and many other inventions, which had tended to advance civilisation, were the results of the free-trade principles which prevailed in England, and of which he was a cordial supporter. The object of the paper was to call attention to the organisation of the corps of the Ponts-et-Chaussées, which he thought, for carrying out works necessarily in the hands of the Government, was superior to our system of appointing Government officers.

The Chairman, in proposing a vote of thanks to Mr. Burnell, said he thought they must all, to a great extent,

participate in the feeling expressed by Mr. Haywood, on comparing the style of the public works in Paris with those of London; and with regard to the sewers, if anything was calculated to mitigate that feeling, it was, as far as he was personally concerned, in the visit he paid to the great brick tank at Barking, covering an extent of eleven acres, which for strength and excellence of execution could hardly be surpassed, and which showed what could be done in England in the way of first-rate brickwork. He was afraid thay could hardly expect to settle the question this evening as to the comparative merits of the two plans, and he thought they must be content with supposing that each nation had settled down instinctively into the particular system which best suited its own peculiar constitution. He was sure they would pass a cordial vote of thanks to Mr. Burnell for his able paper.

The vote of thanks was then passed.

Proceedings of Institutions.

Farnham Young Men's Association. — The lecture session of 1863–64 was brought to a conclusion on Friday evening, the 11th instant, by the delivery of a lecture on "Figures of Speech," by the Rev. W. L. Blackley, of Frensham. The Bishop of Winchester occupied the chair, and said it was no "figure of speech" when he expressed his regret that this successful session was over.

Metropolitan Association.—His Royal Highness the Prince of Wales has been pleased to accept the office of patron, and Her Royal Highness the Princess of Wales the office of patroness to this association. Her Royal Highness has also announced her intention to give annually a Bible as a prize to the female candidate who, obtaining a certificate of proficiency in needlework, obtains the highest marks in the elementary examinations held by this association.

Stockport Mechanics' Institution.—The twenty-ninth annual report congratulates the members on the cheering prospects of the Institution. Notwithstanding the continuance of commercial depression, and all the disadvantages of removal, every department of the Institution has been more successful this year than in any previous one. The year 1862 closed with 504 members, but last year gave an increase of 361, making a total of 865. The average number of members, since the establishment of the Institution in 1834, is about 528. The total income of the past year, exclusive of donations, has been £406 16s. 9d. This is £150 more than the average of previous years. The members' subscriptions amount to £207 14s.; those of 1862 were £117 17s.; and the average of previous years has been £143 3s. 10d. The letting of the hall has been a source of considerable income, amounting to £36 6s. 6d. At the close of the year 1862, the library was reported to be in a very dilapidated condition; and the directors, on their coming into office, after a careful examination of the books, removed 183 volumes as unfit for further circulation on that account; and they have, during the year, purchased and added 293. In addition to that number thirteen volumes have been presented, and the President has purchased for the library 112 volumes of the best and most popular works of the day. The library now contains 4,338 volumes. The books issued in 1862 were 5,100; in the past year, 8,532. There have been, during the year, three lectures, one concert, and three readings, in connection with the Institution. The Mayor of Stockport (Ephraim Hallam, Esq.) has invested £100 as an endowment of the Institution in perpetuity, the interest to be appropriated annually in prizes for the most successful competitors in examinations of the arithmetic and drawing classes. These classes are now in so high a state of proficiency as to occupy the first position in the Lancashire and Cheshire Association of Mechanics' Institutes, in connection with which certificates for proficiency in algebra, mensuration, composition, French, and other subjects, have been gained by students of this Institution. The credit of the Institution has been fully sustained, this year, in the mechanical, architectural, and geometrical drawing class, in connection with the Science and Art Department of Government. The Government returns show that, compared with the number of pupils who attended the examination, a greater proportion of them have received Queen's prizes than the members of any other Institute in Lancashire and Cheshire. In the reading classes the teachers report considerable general proficiency. The writing classes are overcrowded, and the students are making rapid progress. The arithmetic classes are well attended. About nineteen members meet for the study of algebra. There are also a grammar class, one for geography, for modern languages, for phonography, for elocution, for tonic sol-fa singing, in reference to which the local examiners report favourably. Five years ago the directors, seeing the great necessity for female education, decided upon the establishment of female classes in reading, writing, arithmetic, and sewing. Some difficulties presented themselves, in the want of room and suitable teachers. These, however, have been overcome, and the result has more than realised the Committee's most sanguine expectations, as testified by the number of female members, which increased in 1858 from 23 to 47. This year they number 243. The directors have made arrangements with the British and Irish Magnetic Telegraph Company to open an office in the Institution for the transmission of messages to all parts of the United Kingdom and the Continent, and for the supply of such daily telegrams as are posted in the Exchange and other public buildings in the City of Manchester.

THE MONT CENIS TUNNEL.

A paper was read before the Institution of Civil Engineers, by Mr. Thomas Sopwith, jun., on February 16, on the actual state of the works in this tunnel, with a description of the machinery employed.

The author said that during the last twenty years many routes had been surveyed and recommended for crossing the great barrier of the Alps. Of these, that by the Mont Cenis was generally considered the most feasible; and it was only a question, whether the mountain should be crossed by a series of inclines, or whether a tunnel should be made. In 1857, Messrs. Sommeiller, Grandis, and Grattoni, brought before public notice a new system of boring by machinery, instead of by hand labour. A Government commission was appointed to examine and report upon it, and to see if it could be applied to the boring of the tunnel under Mont Cenis. Their report was favourable, and M. Sommeiller and his partners were shortly afterwards charged with the execution of the work.

The ends only were available for attack, it being impossible, as was known from the first, to sink shafts. It was feared that the ventilation would seriously retard, or altogether prevent, the completion of the tunnel; but this fear was uncalled for, as the artificial ventilation in collieries overcame greater natural difficulties, and the ventilating current passed through a longer distance than could possibly be required in this tunnel. M. Sommeiller also proposed to use compressed air for driving the machinery, and calculated that on its escape, a volume of fresh air would be supplied, adequate to the requirements of the workmen. The tunnel at the Modane, or French side, was of the following dimensions:—25 feet $3\frac{1}{2}$ inches wide at the base, 26 feet $2\frac{3}{4}$ inches wide at the broadest part, and 24 feet 7 inches in height; the arch being a semicircle nearly. At Bardonnèche, the height was increased $11\frac{3}{4}$ inches. The exact length between the ends was 7·5932 miles. The present ends would not be the permanent entrances, as it was intended that a curved gallery should leave the tunnel at the north side, 415 yards from the end, and at the south side, 277 yards. At Modane, the tunnel was built entirely with stone; at

Bardonnèche, for the greater part, the side walls only were of stone, and the remainder of brick. The Bardonnèche end was 434 feet higher than that at Modane. For one-half the length of the tunnel, therefore, from Modane to the middle, the gradient would be 1 in 45½; the other side being driven with only sufficient fall, 1 in 2,000, to allow of the water escaping. At Modane, the entrance of the tunnel was 328 feet above the bottom of the valley, where the workshops were placed, with which there was a communication by means of an inclined plane, worked by a water balance.

Different systems of tunnelling by machinery had been tried, amongst others one by Captain Penrice, R.E., in which it was intended to drive a gallery about 4½ feet diameter, and by means of repeated blows from a heavy frame loaded with knives, to reduce the whole of the excavated materials to small chippings and dust. It seemed, however, to the author, that any system of tunnelling must be deficient which did not make gunpowder available; and that by the trituration of the rock to such small particles, as in Captain Penrice's system, a great amount of work was unnecessarily performed.*

In M. Sommeiller's system, whilst machinery was employed for accelerating the progress usually made by hand labour, gunpowder was also available. He had succeeded in producing a compact machine, not weighing more than 6 cwt., which could pierce a common borehole, about 1¼ inch diameter, and 3 feet deep, into a rock in twenty minutes, where two miners would have required two hours. Further, he had arranged a moveable support capable of carrying eleven such machines, any one of which could be worked at almost any angle, and of allowing the free action of each, in a gallery 10 feet square. This support could be removed when it was necessary to explode the holes bored by the machines. The machine consisted of two parts;—one, a cylinder for propelling the borer against the rock; the second, a rotary engine for working the valve of the striking cylinder, turning the borer on its axis at each successive stroke, and advancing, or retiring, the striking cylinder, as occasion required. It gave 250 blows per minute. The effective pressure on the piston in striking was 216 lbs.; the length of the stroke was from 2 inches to 7½ inches. Although simplified as much as possible, they were liable to frequent derangement, and a large stock was kept on hand. The compressed air was used at a pressure of five atmospheres above atmospheric pressure, and was conveyed to the 'fore-head' of the advanced gallery by a pipe 7⅝ inches in diameter. The advanced gallery was the only place where the machines were used; the enlarging of the tunnel to the full size, walling, &c., being performed by manual labour. The system of working was to bore eighty holes in the fore-head of the advanced gallery. The frame and machines were then withdrawn, and a set of men charged and fired the holes; these were afterwards replaced by another set to remove the *déblais*. Two descriptions of machines for compressing air were in use,—one on the hydraulic ram principle, the other resembling a pump. In the first, the water was admitted, with a pressure of 85¼ feet, into a column, or vessel, containing air, about 14 feet high and 2 feet in diameter. The water by its momentum rushed up the column, compressed the volume of air, and forced it through a valve into a reservoir. The pressure valve being closed, the exhaust valve was opened, and the water fell in the column, at the same time its place was taken by air, and the machine became ready for another stroke. This machine made 2½ strokes per minute, and was capable of supplying about 20 cubic feet of air, compressed to five atmospheres, per minute. The other machine consisted of a horizontal pump and two vertical branches. The piston was surrounded by water, which rose and fell alternately in the two columns: when it rose, compressing the air, and forcing it through the outlet valve; and when it fell, creating a vacuum, which was filled by air at atmospheric pressure.

The tunnel, on the 30th June, 1863, had been driven (including the advanced gallery) at Modane 1092·25 metres, and at Bardonnèche 1450·00 metres. The advancement in June last, at Modane, was at the rate of 4·719 feet per day. At this rate of progress at both ends, the tunnel would be finished in 9 years 2½ months from that time. It was not, however, too much, in the author's opinion, to expect a progress of 2 metres per day at each end, seeing that machines had only been in use at Bardonnèche about two years and a-half, and at Modane half a year.

The result of a rough comparison was to show that, in the present development of the Sommeiller system, an advancement three times quicker than by hand-labour might be effected, but at about two and a-half times the cost; judging rather of places where it might be generally applied, than by the Mont Cenis only. In the case of a tunnel through rock, costing, when completed, £30 per yard, the two systems might compare as follows:—an increased advancement in favour of M. Sommeiller's machinery of 3 to 1, at an increased cost of 4 to 3.

* One of Capt. Penrice's machines is now at work in a rock tunnel on the Levanto and Spezzia Railway, and recent letters from Italy state that it is cutting the gallery, 7½ feet in diameter (not 4½ feet), at the rate of about 14 feet run in the 24 hours. The gallery is afterwards enlarged by blasting or other means.—Ed.

Fine Arts.

The Fine Arts in Paris.—A very important step in the way of artistic education has been taken by M. Nieuwerkerke, the Imperial Superintendent of the Fine Arts. The gallery in the Louvre, in which the Sauvageot collection was recently placed, has been converted into a studio, where artists and amateurs will be admitted shortly to sketch the vases, jewelled cups, bronzes, and other works of art belonging to the various collections in the museum, under the superintendence of an officer of the establishment. This will be a great boon to designers and ornamental artists of all classes, who have heretofore had little opportunity of practically studying the finest products of modellers, carvers, and chasers of the best periods. The auctioneer's hammer has disposed of a large number of fine works of art during the last week, but the Delacroix sale has taken the cream off the bowl. At an important sale which occurred on the 9th instant, "Clorinde," a fine work by the painter last named, was sold for 7,500 francs, to the astonishment of all who had watched the collective sale of his works; some of Decamp's pictures fetched fair prices; the well-known "Turkish Guard" fetched 3,700 francs, and "Diogenes throwing away his Cup on seeing a Boy drink out of the hollow of his hand," by the same painter, was withdrawn at 10,000 francs. A picture by Prudhon and Mayer, "A Nymph attacked by Cupids," was also withdrawn at 15,000 francs. The "Two Foscari," by Robert Fleury, fetched 7,200 francs. M. Alaux, the painter, formerly master of the French school at Rome, recently died at Paris, at the age of 79 years. M. Vital Dubray, the sculptor, had an unfortunate accident the other day. He had just completed an equestrian statue of Napoleon I. for the town of Rouen; a commission had seen and highly approved the work, which was about to be delivered into the hands of the moulder, and M. Dubray was in the act of turning it about to exhibit his work to some important visitors, when the central support gave way, and in an instant the labour of a whole year lay, a confused heap of clay, on the floor. M. Hermin, lately deceased, has bequeathed to the Imperial Library a magnificent collection of engravings and sketches relative to the history of France. It fills a hundred portfolios, and includes 20,000 engravings, many of them of great rarity. Amongst other curiosities are five hundred of

the rare illustrated almanacks of the sixteenth and seventeenth centuries, some of them dating from the time of Henry IV.

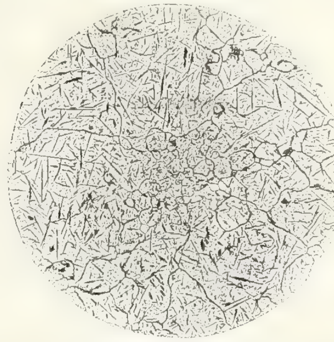
Manufactures.

TOW AND WASTE OF FLAX. — The paper manufacturers of the North of France propose to address a petition to the Minister of Agriculture, of Commerce, and Public Works. Its object is, to demand from Government that the waste of flax, common tow, and refuse, now free for export, should be in future assimilated to rags, and subject to the same duties. The petition, of which an abstract is given in the *Paper Trade Review,* states that flax waste, common tow, or refuse, forms an important part in the making of paper in France. In the treaty of commerce with England, the Government, acknowledging the necessity of protecting the paper-trade, maintained protecting tariffs for rags; but on one side it declared free to export flax and tow. It would seem natural that flax waste, unfit for spinning, and entering into the class of rags, should be assimilated to them. It has not been so; they have been, and are still, free from all export duty. However, for some time, and until the month of August, 1863, the administration of customs had stopped their exportation in some places, considering them as rags. But on August 25, 1863, the Director-General of Customs informed the Director of Dunkirk that, in answer to interested merchants, experts had declared that, although waste can be used for paper-making, it is also used for the making of coarse cloth packing, and for stuffing furniture or seats; that the consulting committee of arts and manufactures had considered the question, and that the departments of commerce and finance had, on its advice, decided to permit its free exportation. The consulting committee [the petitioners go on to say] might, indeed, say that coarse cloths can be made from, and furniture stuffed with, tow; but, in reality, their use for this purpose in Belgium is small, and the commonest sorts, such as dried flax waste, are completely unfit for that. It can even be proved that all exported in Belgium was bought by the Belgian paper-makers. These have caused the rise in price of which the northern manufacturers now complain. The augmentation of their first matter has risen from three to four francs the cwt. (100 kils.), which makes a difference of six or seven francs the cwt. of manufactured paper. However, the products of the French paper-trade have undergone a depreciation equal to these figures. There has resulted such a situation as many paper-makers could not resist. The northern paper-makers ask, consequently, that the decision of the committee of arts and manufactures should be changed, and conclude that the refuse and tow should be reckoned as rags.

CARPET MANUFACTURE. — The action commenced on 21st September, 1859, by Messrs. Crossley and Sons, the well-known carpet manufacturers at Halifax, against Messrs. Bright and Co. of Rochdale, for an alleged infringement of a patent granted on 28th September, 1850, to Messrs. Crossley, Collier, and Hudson, for "improvements in printing yarns for, and in weaving carpets, and other fabrics," has just terminated, the arbitrator's award is in favour of Messrs. Bright and Co., the defendants; the arbitrator having found that the plaintiffs were not the first and true inventors of the improvements in printing yarns, and that the defendants have not infringed that part of the patent which relates to improvements in weaving carpets and other fabrics. The general costs of the reference, and award, are to be paid by the plaintiffs. These must be very great, as, in addition to the witnesses examined, the models on both sides were extremely numerous, and in the course of the proceedings the plaintiffs sent up to London, and worked by steam-power at their warehouse in the city, a loom containing the improvements in weaving alleged to be infringed. The defendants also had two looms set up, and working by steam-power in the neighbourhood of Westminster.

NATURE PRINTING FROM STEEL.—Below are given prints from steel blocks, prepared by Mr. Sorby, as described in the *Journal* of the 4th inst., p. 258 :—

Square Block of Iron twice converted; transverse section showing the centre incompletely converted.



Round Bar of "Homogeneous Metal" converted—transverse section.

Commerce.

COTTON IN MEXICO.—A French vessel has arrived at Havre with a cargo of satisfactory cotton grown in Mexico. There is no reason why cotton culture should not be extended in Central America. An excellent specimen was grown in Honduras, and was shown before the members of the Society of Arts by Mr. Temple some years ago; and excellent samples from Venezuela and other States at the International Exhibition.

THE FRUIT TRADE.—The imports of currants last year marked the largest amount known, upwards of 46,000 tons, of which 38,4000 were taken for consumption, and about 5,000 tons exported. Of raisins the imports have been larger. Of 21,000 tons received, 15,600 were taken for home consumption, and 2,000 tons re-exported.

TEA.—The shipments from China to Great Britain, in the twelve months ending May, 1863, marked the large amount of 121,273,580 lbs., and in the eight months ending January last, 99,776,226lbs. had been shipped.

TIMBER.—The quantity of wood and timber imported last year (exclusive of mahogany and other hard woods, and dye-woods), was 3,437,915 loads, an excess of half a million loads on the previous year. The duty received by Government on this wood, in 1863, was nearly £272,000.

WINE.—The wine trade does not show that expansion which was anticipated from the reduced duties, for the quantities taken for consumption last year was below those of 1861. Of ten millions and a half gallons which paid duty, six millions were white wines, and four millions and a half red. The total imports were about two million gallons in excess of those of 1862.

Proposed New Weights and Measures.—The weights and measures to be authorised by Mr. Ewart's permissive Bill, if it should pass, will be as follows:—Instead of the yard there will be the "metre," which will be about a yard and a tenth, 39·371 inches, the other measures of length to be its decimal multiples or divisions; thus, on the one hand, there will be ten metres, called the "dekametre," and on the other, the tenth of a metre will be the "decimetre," and so on. 1,000 metres, a kilometre, will be the nearest approach to the old mile; it will be nearly two-thirds of a mile, 0·621. For square measure the unit will be an "are," which will be about 120 square yards, 119·603: a "centiare," the hundredth part of an are, or a square metre, will be the nearest to our square yard, being one-eighth more, 1·126. 100 ares, a hectare are 2·471 acres. For measures of capacity the unit will be the "litre," about a pint and three quarters, 1·761. Ten litres, a "dekalitre," will be two gallons and a fifth, 2·201. The small drinker may take his "decilitre," about the sixth of a pint (0·176), or his "centilitre," which is a tenth part of a decilitre. For weights the unit will be a "gram," nearly 16 grains, 15·433; 1,000 grams, a "kilogram," will be about two pounds and the fifth of a pound, 2·205; 1,000 kilograms, 2,204·714 lbs., will be a ton. The double and the half of all these measures and weights may also be used.

Colonies.

Colonisation of North Australia.—A colonial paper says that the temporary cession to South Australia of that part of the continent that lies between the northern boundary of that colony and the north coast, seems to have awakened much enthusiasm on the prospect of founding a new settlement. Practically, the new territory is isolated from the old government, and though Stuart has passed by land from Adelaide to Van Dieman's Gulf, it is very doubtful whether stock could be sent across the continent by his route. In course of time the central tract may become pastorally tenable, but an abundant water supply must be first discovered or provided. This would probably be a work of great difficulty and expense, so that it appears that a considerable time would elapse before the squatters of South Australia could spread northwards in sufficient force to occupy the new territory, more especially as there are vast areas of land of superior quality more conveniently situated, as respects seaports and markets, and which will first attract attention. The better plan would be to commence on the north coast, to found fresh settlements there, and, whilst maintaining a sea communication with the parent colony, to work gradually southward, so as to meet the advancing settlers of South Australia, for the basis of fresh colonisation must be pastoral occupation, and the first thing to be done is to induce squatters to take their flocks and herds to the new country. The chief difficulty will be want of money. The sale of land will yield something, but it will not be wise to stimulate speculative purchases simply for the sake of getting money. The value of the land will depend upon the prosperity of the settlement, and the Government of South Australia should not expect the new colony to pay its way from the very first, but there is every prospect that, with good management and liberality on the part of the South Australian Government, the work of colonisation may at no distant date make rapid progress, and that by the establishing of stations at intervals along the already partially explored track, the difficulties of the land route to the northern coast may be overcome, and the interior of this vast continent be gradually opened to civilisation, and ultimately afford an enlarged field for British enterprise. Central Australia is divided by Mr. Waterhouse, the naturalist, who accompanied Mr. Stuart in his last expedition across the continent, into three zones—the first he describes as the district of saltbush and springs; the second is characterised by the presence of mulga shrub; the third is the tropical district of Arnheim's land. The abundant and apparently permanent supply of water—independent of rain—renders the first zone very suitable for pastoral purposes. The springs mostly appear in hollows, emerging from small boggy mounds which they overflow, and seem to be of volcanic origin; there is evidence of a large tertiary drift, and Mr. Waterhouse is of opinion that many springs may be obscured by this drift and will be disclosed as the country becomes examined. The second zone extends from latitude 27½ to about 17½; the land is not of promising quality, alternately stony and sandy; the sand yields only mulga shrub, spinifix, or porcupine grass, with a little grass thinly scattered in small patches; permanent water is hardly to be found; here and there, however, are patches of better country: to make this belt of country habitable it will be necessary to store the water carefully. The third zone, from latitude 17½ to the northern coast, has the characteristics of a tropical climate, the grass and timber improve, and at places the vegetation is luxuriant. In regard to the climate, Mr. Waterhouse says that even in winter they found the heat very oppressive, and he fears that in summer, especially near the coast, the climate will be hardly suitable for Europeans; this, however, is to be tested by experience; and it may be mentioned that only a few years ago the neighbourhood of Rockhampton was erroneously thought to be too tropical for European settlement.

The New Zealand Exhibition, 1865.—The decisions and regulations of this exhibition, proposed to be held at Dunedin, in Otago, in January next year, were published recently in the *Journal*. For the information of intending exhibitors it may now be stated that applications for space and all other information should be addressed to John Morrison, Esq., the government agent for the colony of New Zealand, 3, Adelaide-place, London-bridge, who has placed the whole correspondence and business details of London management in the hands of Mr. P. L. Simmonds, who, with Dr. Lindley, had the superintendence of the colonial department of the International Exhibition of 1862. The enterprise is being carried out with great spirit and energy by the colonists. The various Australian colonies will take a prominent part. The intercolonial steamers have agreed to convey goods for exhibition to and from for one rate of freight, and the English shipowners have very generally reduced their charges on goods intended for the exhibition.

The Bengal Agricultural Exhibition is over. The attempt to induce native ladies to visit the Exhibition utterly failed.

South Australia.—The total imports at Port Adelaide, from the beginning of the year 1863, to December 19th, have amounted to £1,815,503, and the total exports to £1,848,849. The value of the cereal exports from all ports in the colony during the same is £718,561 12s. 9d. The customs' receipts have amounted to £153,861 8s. 2d., and the railway receipts to £94,694 11s. 4d. The land sale receipts from the beginning of the year to December 24th, have been £190,648 13s., the quantity sold being 157,582 acres. The accounts of the crops continue to be favourable, and the average yield of wheat and barley is larger than has been had for many years. The accounts from the mines continue to be favourable; the increased value of copper tends to increase workings in some mines whose returns are small. The reports from the Campbell's Creek Lead Mine are highly favourable. The wines of last vintage are fast being brought into consumption, more especially the medium and inferior qualities, which pay the growers better by an early sale.

Roads and Military Settlements in the Northern Island of New Zealand.—A memorandum of a proposed system of roads and settlements for the defence of the provinces of the Northern Island of New Zealand, has been under the consideratian of the Ministry in that colony. This document points out that the most obvious means of preventing future wars would be the making of

roads that could be used by the military everywhere throughout the country, and the introduction of such an amount of armed population, formed into defensive settlements, as would overawe the native tribes, or at least be always ready and able to check or punish their depredations. Both these measures have been commenced. It is proposed in this memorandum to extend and continue them as far as appears to be practicable in the present circumstances of the colony. The first consideration is —what lines of road to make, and where to place the settlements? Speaking in general terms, the Northern Island may be described as one entire expanse of forest and mountains, with the following exceptions:—A broad belt of country, generally open, stretching from the Waikato river on the one side, and the mouth of the Thames river on the other, and running all the way to Napier, forty or fifty miles wide at one part, and narrowing gradually southwards down to the coast at Cape Turnagain. All round the Cape Turnagain to Wairapura, and up to the west coast, runs a comparatively narrow belt of open ground, running up occasionally some distance into the interior, and forming rich values fit for settlement. Near to the shores of Lake Taupo, on the west, east, and south, are plateaux or terraces of some extent, wooded or grassy, which form a sort of elevated table land in the middle of the island, interspersed with clusters of high mountains, but soon descending, except on the Hawke's Bay side, into rougher ranges and gullies, forming, especially on the west, tracts of difficult country, separating these central terraces from the available valleys and flats round the coast. Now, the most ready way to overcome this country by means of roads and settlements, at first sight, would be to strike through the centre of the land from Auckland to Napier, and from the Bay of Plenty to Wanganui or Rangilikei, with branches through the heart of the tracts intervening. The cost of the 1,000 miles of roads proposed may be calculated at an average of £1,500 per mile, or £1,500,000. The introduction and settlement of immigrants, and the making of roads as above proposed, would cost in all about £2,300,000, but as money will be wanted for the heavy expenses of the war during the present and probably the next year, which cannot be estimated at less than a million, it is proposed to add this sum to the existing loan. The total cost of the present scheme will be £3,500,000.

Obituary.

The late Sir William Brown, Bart., was born in May, 1784, at Ballymena, in the county of Antrim. His father, Alexander Brown, was engaged in the linen trade, which was then carried on mainly as a domestic manufacture. The regular employment thus afforded, and the staid and thrifty character of the people—rather Scotch than Irish—and commonly Presbyterians, gave to the locality an aspect widely different from that of the central and southern parts of Ireland at the same time. Young Brown was sent to school in Yorkshire, but his health was weak; an affection of the eyes interfered with his education; and it is not improbable that the lack of physical power which he displayed later in life was traceable to the management of his boyhood. When he was about sixteen his father went to the United States, and settled at Baltimore, starting as a merchant, with good connections in the linen trade, and taking his sons into his counting-house. The time was favourable, and the man was well fitted to use the advantages it offered. Prudent, patient, and moderately pushing, he had but to hold his ground and grow with the city and the state. In 1800 the troubles left by the revolutionary war had vanished, the new Government was settled, and the centres of commerce, of which Baltimore was one of the chief, were becoming yearly more and more busy and prosperous. Cotton, the first bags of which coming from the United States, had been landed in Liverpool in 1785, and there seized by the customs' officers as not being the produce of the States, was already becoming an important article of export. Upland cotton, nearly worthless till Whitney's saw-gin, in 1793, began to supersede hand-labour in discarding the seed, was, in 1800, creeping rapidly over large districts in the Southern States; and the cotton planters were coming into existence as a thriving and powerful class. The States were already sending more cotton to England than were the West Indies. But the trade was hampered by want of capital, distance of market, and slow communication. Men who could be trusted, who knew the English markets, who had connections there, who could open channels of trade with Europe, and insure the returns, and, especially, who could make advances on goods ready for shipment, were much sought for, and could make their own terms. Among such men was Mr. Brown. The young house, as it grew, was extended to New York and Philadelphia. The business, small at first, was soon extended. They seldom bought or sold; finding more profitable use for their capital in conducting, and making advances on, the transactions of others: taking ample security, and realising a moderate but certain profit. Banking was little understood, and still less relied on, in the United States. On a large scale, its facilities were more used by politicians than applied to trade; and where knowledge of markets, and of men, could be had together with banking accommodation, customers were never wanting. As Mr. Brown's sons grew up they were taken into partnership; and soon it was determined that William, then approaching twenty-five years of age, should return to the old country, and open an office there. He did so, early in 1800, and, having married a Miss Gihon, also a native of Ballymena, he went to Liverpool; and was soon established there, in correspondence with the house in America. Again the period of starting was favourable. The years 1803 to 1808, inclusive, had been years of depression in the cotton trade. With 1809 came better times, and nearly thirty years expired before a similar period occurred. Also the banking system of the United States was, for some years after this date, in such a condition as greatly to favour the operations of those who, having capital and credit in both countries, could use them with competent knowledge and discretion. The first "Bank of the United States," got up by Alexander Hamilton, when Secretary of the Treasury to the Federal Government, and opposed by Jefferson and his followers, had, from the first, been used by the "Federal" party as a political instrument. Its charter was to expire in 1811. The proposal to renew it brought on a party contest. It was negatived by a narrow majority. The advocates of state banks being in the ascendant, a large number of such banks were soon chartered. Then came the war with England. The government determined to meet the war expenditure with loans. These could be had easily only through banks; and banks were further multiplied as feeders to the public treasury. In August, 1814, specie became alarmingly scarce. The banks were authorised to suspend specie payments, and, with few exceptions, they did so. The war was closed in less than six months; but the flood of inconvertible paper was then, as now, found so agreeable to all parties, that the suspension was continued, and new banks formed, so that every part of the country might share the new-found benefit. The New England Banks, to their credit, strove hard to maintain cash payments, but the only apparent result was to drive trade to Baltimore and the more southern ports, where debts, and even import duties, could be discharged in a depreciated currency. Also, at this time, 1810-12, transatlantic produce, especially coffee and sugar, abundant in England, and there selling at sixpence a pound, was selling on the greater part of continental Europe at eight and ten times that price. There were high risk and large profit, but for those who avoided the risk and took only a moderate share of the profit, the gains were great. The

American and Liverpool houses held on their course, on new and more extended grounds, indeed, but in close alliance, under the same principles, and, in fact, under the same superintendence (for Mr. Alexander Brown died only in 1834) till the sons were some fifty years of age, and till the firm of Brown, Shipley, and Co., of Liverpool, became known wherever the American flag was seen. The house never encountered but one severe trial, That came when its strength was fully developed; it came, probably, from no want of mercantile skill or foresight; and it was so averted as to attract the attention and confirm the respect of the entire mercantile world. The circumstances are worthy of remembrance, even apart from their connection with the life of William Brown. The years 1832-33-34 were, in England, years of gradually increasing commercial ease and prosperity. The prices of corn and provisions were gradually declining through the whole period, and the low level thus reached in the cost of food was for some time maintained. From October, 1834, to February, 1836, the official monthly average price of wheat ranged between 35s. 6d. and 41s. per quarter. Capital had accumulated, and the rate of interest had fallen. From July, 1832, to July, 1834, the minimum Bank of England rate was 3 per cent., without change. The demand for cotton, woollen, and linen goods, and generally for all the principal articles of British manufacture, was increasing, both for home consumption and for export. New factories were being built, and wages were rising. Money being abundant, a disposition to speculate in joint-stock companies, and especially in joint-stock banks, became prevalent; and several new banks, with numerous branches, were opened in the North of England, to supply the growing demand for banking accommodation. But there was something underneath, not seen. The ordinary course of trade was being interfered with from without to a dangerous extent, both in England and in America. When, in 1832, it was determined that the trading monopoly of the East India Company should cease, the company began to realise its commercial assets; and pending the ultimate disposal of the money, paid it into the Bank of England. The Bank privately lent it to the bill-brokers at 2½ per cent. Shortly afterwards, the payments on account of the loan contracted by the Government to pay compensation for the slaves in the West Indies also began to accumulate at the Bank, and this sum, a very large one, the Bank also lent in like manner. At the same time the second Bank of the United States was coming to the end of its charter, and the Government was determined not to renew it. General Jackson wished to restore the use of gold and silver coin in the States, and in order to do this, Congress had, in 1834, prohibited notes of less than five dollars, and, by reducing the fine gold in the eagle from 246 to 232 grains, and so raising the value of the English sovereign as measured in dollars, by more than eight per cent., had prepared to draw gold from Europe. The United States Bank was called upon to pay in specie the amount it owed to the Government, and had to borrow in Europe to do this. The State Banks who were to receive the Government deposits were so favoured on condition that they should hold large reserves of specie. Then, at the end of 1835, our stocks of American produce proved very low. Large orders went out for fresh supplies; but before they could arrive the drain of gold from this country had gone so far, in spite of a considerable rise in the rate of interest, as to alarm the Bank. In December, 1835, it held in bullion £7,595,000—in November, 1836, only £3,840,000. The draft had been made chiefly through the American houses, and was set down to excessive speculation in American produce, fostered by these houses. The Bank began to refuse their acceptances. Already, by the arrival of large quantities of produce, ordered in the first months of the year, which had come to falling markets, the weaker of these houses were pressed to the full extent of their means. They, in turn, had pressed their debtors; and now, their own credit failing, they became desperate. Produce was forced on the market, and signs of a panic began to appear. In November, 1836, the Agricultural and Commercial Bank of Ireland stopped payment, and the Northern and Central Bank at Manchester would have been stopped had not the Bank of England for a time supported it, in view of the probable consequences. For several months after this, under increasing pressure, and such pressure as probably no private firm had ever before sustained, Brown, Shipley, and Co., of Liverpool, stood before the storm, and so stood till the worst of it was over. Then, laden with obligations involving the probability that they would have shortly to provide about two millions sterling—with a general suspension of the banks of the United States crippling their powers in that direction, amply secured, indeed, by the possession of produce, but unable to convert it into money—they laid their affairs before the Treasury Committee of the Bank of England. It was a case of even national import. The facts were clear. The aid asked was very large. But the evil to be averted was great, and the ultimate risk was not so. The aid was given. It was discreetly applied. Its effect was all that had been hoped for; and the transaction was closed to the entire satisfaction of both parties. Further, it carried with it no reflection upon the ruling virtue—the prudence—of William Brown; and it placed him at once in such a position, with reference to the American trade, as no man had before occupied. Mr. Brown had not, down to this date (1837) taken a very active or prominent part even in the public affairs of the town of Liverpool. But that, afterwards, having a decidedly liberal bent in politics, he should be drawn into the free trade party, should be borne with it into Parliament, and should have opened to him every avenue to public distinction in which a princely income could be used, was to be expected. He was not without a relish for such distinction, but he was ill-fitted for it. He had but little physical power. His mental power was not great; and the sedulous application of a long and uniform life had fixed its action to a somewhat narrow round of thought. His strength lay in moderate ability, closely allied with and governed by the prudential virtues, and steadily applied to a definite purpose. He did not attract others; though he readily won their confidence in his probity and stability of purpose. Hence he commonly acted alone. His means enabled him to make large gifts to public uses; and in his choice of these uses he strongly marked his sympathy with patient industry, looking, through small beginnings, up to wealth, and the consideration that wealth brings with it. His gifts were made with sound judgment—with the same balancing of the power to be expended against the assured value of the object to be attained, whence had sprung his own success as a mercantile man. Hence they are likely to realise his intentions. And, regarded as a whole, his career may be said to exemplify better, perhaps, than that of any man who has died in England for many years—because more singly and clearly—the net value of prudence, patience, and perseverance, as promoters of commercial success. In January, 1863, Mr. Brown received a baronetcy; the same honour being, at the same time, conferred on one or two other men distinguished in commerce. He survived his wife and nine children, and is succeeded in his title, and the bulk of his property, by his grandson, now Sir William Richmond Brown, Bart. He was elected a member of the Society of Arts in 1853, and more than once served the office of Vice-President.

Notes.

National Museums.—The following petition of the delegates of the trades of London, has been presented to the House of Commons by Sir John Shelley:—"Your petitioners, representing the following trade societies, viz.: carpenters (6 societies); painters (4 societies); tailors (3 societies); carvers and gilders (3 societies); French polishers (2 societies); bootmakers (2 societies); cabinet

makers (West and East End societies); goldsmiths and jewellers (West End and Clerkenwell); silversmiths (united branches); engine-turners; engravers, and dial finishers; coachmakers; coachmakers, United Kingdom; coach painters; coach-lace weavers; women's shoemakers; brass founders; brass-moulders' firemen; brass-moulders' finishers; plumbers; plumbers' brass finishers; tinplate workers; stove makers; plasterers; stonemasons; bookbinders; letterpress printers; smiths; machinists; farriers; curriers; wire weavers; plain and fancy silk weavers; umbrella and parasol silk weavers; upholsterers; and dyers; would earnestly solicit the attention of your honourable House to their case, as embodied in the following resolutions, unanimously adopted:—1. This meeting of delegates of the trades of London, specially appointed and convened to give expression to their views and desires on the opening of the national museums, galleries, and libraries on Sunday afternoons, hereby declare and make known that, with the greatest unanimity, the various trades for which they appear have expressed their strong desire for the same, as a measure of right and justice, and of social and art culture, for the people. 2. The said opening of the national institutions on Sundays is not urged from any antagonism to religion or the established forms of worship, but with a sincere conviction that, in the afternoon improvement of man's nature and intellectual capacity a religious duty perfectly in accordance with the morning worship will be fulfilled. 3. We, as practical working men, regard the assertion that the opening of the national museums, &c., would convert Sunday into a working day as fallacious and erroneous, and as being made by parties unacquainted with the tendency of the opening of such places, which is to cause men who now work at home on that day to abandon it, and take recreation. That we, as working men, would be the last to impose any injustice upon the attendants of such places, and conscientiously believe that such public service will be cheerfully and voluntarily rendered by the payment of a fair remuneration. 4. The concession of the opening on Sunday of the National Gallery of Ireland warrants the hope of the same privilege being afforded to the people of London; and the Government (in the person of Lord Palmerston as Premier) will be waited upon by the delegates in deputation, to urge the opening of the National Gallery and other institutions, and also the carrying out the strong wish of the late Mr. Sheepshanks, of his pictures (the gift to the nation) being opened to public inspection on Sunday. 5. A petition to be drawn up in accordance with the above resolutions, and entrusted to Sir J. V. Shelley, Bt., for presentation to the House of Commons. Your petitioners therefore, on the part of the large bodies of working men they represent, most earnestly pray your honourable House to extend the principle established by the opening of Hampton Court Palace, Kew Gardens and Museum, the National Gallery of Ireland, the Picture Gallery of Greenwich Hospital, &c., by the opening of the remaining national institutions paid for out of the taxes of the people on Sunday afternoons. And your petitioners will ever pray.—James H. Wright, Chairman.

Agricultural Meetings.—The following agricultural meetings and shows are announced to be held before Midsummer:—Kelso Agricultural Society, at Kelso, on the 24th March; the Royal Dublin Agricultural Society's spring meeting, at Dublin, on the 29th March and three following days; the Lauderdale Agricultural Society, at Lauder, on the 2nd April; the Royal Jersey Agricultural Society, at St. Helier's, on the 6th April; the Wharfdale Agricultural Society, at Otley, on the 15th April; the Great National Horse Show, at Dublin, on the 15th and 16th April; the spring meeting of the Ayrshire Agricultural Society, at Ayr, on the 26th April; the International Steam Ploughing Match, at Roanne, France, April 27th to May 7th; the Royal Jersey Agricultural Society's second meeting, for cows and implements, May 25th; the Royal Cornwall Agricultural Society's meeting, at Saltash, Plymouth, June 1st and 2nd; the North Hants Agricultural Society's meeting, at Basingstoke, June 2nd; the Bath and West of England Agricultural Society's meeting, at Bristol, June 13th to 17th; the Norfolk Agricultural Society's meeting, at King's Lynn, June 15th; the Oxford and Banbury Agricultural Society's meeting, at Banbury, June 21st; and the Essex Agricultural Society's meeting, at Harwich, June 23rd. The following meetings will be held in the Netherlands:—At Harlinger, Friesland, June 8th, for agricultural implements and machinery. At Zieriksee, Zealand, a port near Rotterdam, June 13th, for agricultural implements and machinery. The great annual meeting or congress of Dutch agriculturists at the Lake of Haarlem, June 23rd, with a market for implements.

Railways.—Mr. Thomas Brassey, the railway contractor, is said to have entered into contracts with the Russian Government, amounting to £24,000,000 sterling, to construct railways from St. Petersburg to Odessa, and from Odessa on to Sebastopol, in the Crimea.

The British Association will hold its next meeting at Bath during the week commencing Wednesday, the 14th of September, under the presidency of Sir Charles Lyall, F.R.S.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Society of Arts, 8. Cantor Lectures, Mr. W. Burges, "On the Weaver's Art."
Actuaries, 7. Mr. Samuel Brown, "On Friendly Societies."
Medical, 8½. Mr. Jabez Hogg, "Eye Diseases as determined by the Opthalmoscope, more especially in relation to the Diagnosis and Surgical Treatment of Glaucoma."
Asiatic, 3.
R. United Service Inst., 8½. 1. Dr. W. L. Maclean, "On the Influence of the present Knapsack and Accoutrements on the Health of the Infantry Soldier." 2. Dr. Richard Domenichetti, "On Sickness Charts, illustrating Diseases, &c., of the Army."
R. Academy, 8. Mr. R. Westmacott, R.A., "On Sculpture."

Tues. ...Ethnological, 8. 1. Mr. Thos. J. Hutchinson, "On Certain Native Tribes of Brazil and Bolivia." 2. Professor Busk, "An Account of a Human Skeleton Discovered under a Bed of Peat on the Coast of Cheshire." 3. Dr. Kirk, "A Description of some Crania of the Manganjo Race of Negroes on the River Shire in South Africa, with an account of the Tribes."
Medical and Chirurgical, 8½.
Civil Engineers, 8. Discussion on Mr. Phipps' Paper "On the Resistance of Bodies passing through Water."
Zoological, 9.

Wed. ...Geological, 8.
R. Society of Literature, 4½.
Archæological Assoc., 8½. 1. Mr. Clarence Hopper, "On some Particulars relating to Bogo de Clare." 2. Mr. Cuming, "On Mediæval Representations of Grotesque Animals."

Sat.......R. Botanic, 3¾.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 24th February, 1864.

19. Railway and Canal, &c., Bills (38. Brecon and Merthyr Tydvil Junction Railway (No. 1); 39. Brecon and Merthyr Tydvil Junction Railway (No. 2); 40. Brecon and Merthyr Tydvil Junction Railway (No. 3); 41. Brecon and Merthyr Tydvil Junction Railway (Purchase, &c.); 42. Bristol and South Wales Union Railway; 44. Caledonian Railway (Bredisholm and Tennochside Branch), (Glasgow Harbour Branches); Calne Railway; 45. Carmarthen and Cardigan Railway; Carmarthenshire Railway; 46. Carnarvon and Llanberis Railway (Nos. 1 and 2); 47. Cheadle, Didsbury, and Manchester Railway; 48. Chichester and Midhurst Railway (Nos. 1, 2, and 3)—Board of Trade Reports.

Delivered on 25th February, 1864.

2. East India (Mr. Burgass)—Return.
54. Ionian Islands—Correspondence.
68. Portsmouth Dockyard Extension—Copy of General Plan.
19. Railway and Canal, &c., Bills (49. Chipping Norton and Banbury Railway; Clyde Navigation Railway; 50. Corris Railway or Tramroad; 51. Crystal Palace and South London Junction Railway; 52. Denburn Valley Railway; 53. Dover, Deal, and Sandwich Railway; 54. Drayton Junction Railway; 55. Dublin and Meath Railway; 56. Dublin, Wick-

low, and Wexford Railway; 57. East and West Junction Railway; 58. East Gloucestershire Railway; 59. East Norfolk Railway; 60. Edgware, Highgate, and London Railway; 61. Edinburgh and Glasgow and Alva Railway; 62. Edinburgh and Glasgow Railway; 63. Ely, Haddenham, and Sutton Railway; 64. Farnham, Aldershot, and Woking Junction Railway; Finchley, Willesden, and Acton Railway; 65. Garstang and Knot End Railway)—Board of Trade Reports.
29. Bills—Railway Construction Facilities.
30. ,, Railway Companies' Powers.
Denmark and Germany (No. 2)—Correspondence respecting Holstein, Lauenburg, and Schleswig.

Delivered on 26th February, 1864.

74. Samuel Wright—Papers.
19. Railway and Canal, &c., Bill—(67. Glasgow and Paisley Joint Line of Railway; 68. Glasgow (City) Union Harbour Tramways; 59. Glasgow (City) Union Railway; 70. Gloucester and Ledbury Railway; 71. Great Eastern Northern Junction Railway; 72. Great Eastern Railway (Highbeech Branch), (Saint Ives to Ramsey); 73. Great Northern and Leeds, Bradford, and Halifax Junction Railways Amalgamation; 74. Great Northern and Western (of Ireland) Railway (Nos. 1 and 2); 75. Great Northern Railway (No. 2) (Lincoln to Bourn), (No. 3) (Doncaster to Gainsborough): 76. Great Northern of Scotland Railway; 77. Great Western Railway; 78. Greenwich and South-Eastern Docks; 79. Halifax, Huddersfield, and Keighley Railway; 80. Hamilton and Strathaven and Caledonian Railway; 81. Hammersmith and City Railway)—Board of Trade Reports.

Session 1863.

493 (3). Import and Export Duties—Return (Part 4).
493 (2). ,, ,, (Corrected Pages of Part 3).
Census of Ireland for the year 1861—Report and Tables, Vol. 2, (Part 4).

Delivered on 27th and 29th February, 1864.

31. Bankruptcy—General Returns.
72. Duchy of Lancaster—Account.
75. Exeter Diocese—Copy of Correspondence.
76. Duchy of Cornwall—Account.
81. Hops—Return.
27. Newspapers, &c.—Return.
31. Bills—Court of Justiciary (Scotland).
36. — Penal Servitude Acts Consolidation.
37. ,, Malt for Cattle (amended).
Austria, Prussia, and Denmark—Correspondence 1851-52.
Danish Crown—Accessions to the Treaty of London.
China (No. 2)—Correspondence respecting the Anglo-Chinese Fleet.
North America (No. 2)—Correspondence respecting the capture of the "Saxon."
Denmark and Germany (No. 3)—Correspondence respecting Holstein, Lauenburg, and Schleswig.

Patents.

From Commissioners of Patents Journal, March 11th.

Grants of Provisional Protection.

Acids, &c., concentrating and distilling—454—E. A. Cotelle.
Bobbing net, manufacture of—448—J. Drabble.
Bottles, &c., rendering air-tight—431—J. J. Chidley.
Buttons, studs, &c., manufacture of—450—S. S. Maurice.
Cask cleansing machines—426—J. B. Jude.
Clay, &c., preparation of, for manufacturing purposes—435—R. Scrivener.
Cotton gins—425—E. Butterworth.
Crushing machines for washing ores, &c.—399—F. C. P. Hoffman.
Desk, church seat, &c., convertible—466—J. C. Whittenbury and J. C. Whittenbury, jun.
Fire-arm and projectile—371—W. E. Gedge.
Fire-arms, projectiles and wads of—445—J. Rigby.
Fire-wood, &c., rendering more combustible—424—F. M. A. de Tregomain.
Fuel—460—A. Wall.
Gas burners, intensifying the light of—386—A. Steinmetz.
Gas, manufacture of—280—J. and C. Hawkins.
Gas, regulating the flow of—467—C. Esplin.
Gas regulator—452—J. Sanders, jun.
Gases, producing and burning—432—F. J. Arnold.
Hats, apparatus for stretching, &c.—422—J. W. Harold.
Horse-shoes, clog to be applied to—461—H. Batt.
Lace machines—423—W. Hickling.
Lace machines, jacquards for—449—J. Oldknow and J. Wood.
Lace-making machine—67—W. E. Gedge.
Lighthouse towers, &c.—430—G. H. Johnson.
Liver pills—408—H. Newmane.
Looms—459—R. Tonge.
Metals, casting of, around cylinders—465—F. S. Claxton.
Mine shafts, safety apparatus for—160—N. J. Le Brun.
Ordnance—437—W. Hale.
Photography—446—A. V. Newton.
Pipe stick—2916—E. Pezold.
Ploughs, manufacture of beams, &c., for—420—R. C., R. J., and J. E. Ransome.
Power looms—456—H. P. Delannoy.
Power looms, 'temples' used in—464—E. Ratcliffe and J. Pearson.
Printing machines—421—A. Applegath.
Railway brake, &c.—404—F. Testuz.
Railway carriages, &c., lamps for—442—F. R. Mosley.
Railway spikes, rivets, &c.—417—E. Watteen.
Railways, construction and protection of—438—J. Hayworth.
Railways, metallic permanent way for—444—W. Brookes.
Railways, securing rails on—407—H. A. Jowett.
Run-away horses, to release from any vehicle—415—J. R. Hoffman.
Seeds, machinery for unhusking—3138—J. C. Wilson.
Sewing, &c., machinery for—447—G. P. Gee and W. H. Gosling.
Sewing machines—2774—A. Prince.
Sewing machines—2845—E. T. Hughes.
Shades for gas lights, &c.—462—L. A. Durrieu.
Ship's boats, apparatus for lowering, &c.—443—H. C. Gamble.
Ships' bottoms, coating and sheathing—451—T. J. Hughes.
Ships' bottoms, composition for coating—436—W. C. Page.
Silver, &c., composition for soldering—418—L. S. Naudin.
Springs, coiled or helical—433—T. Jackson.
Stays, manufacture of—416—C. Field.
Steam, apparatus for condensing—440—J. Gerstenberger.
Steam boilers, &c., preventing corrosion in—419—J. Travis.
Steam engines—458—W. Rowan.
Steam-engines, regulators for—434—W. Jones.
Surgical bandages, manufacture of—406—E. Moore.
Warping machines—453—J. Howard, J. Bullough, and T. Watson.
Water economiser used with fish ladders—455—J. H. Horsfall.
Weights, apparatus for raising, lowering, &c.—429—E. J. Leonard.
Windows, &c., excluding dust, wind, &c., from—427—J. W. Browne.

Invention with Complete Specification Filed.

Furniture, &c.—544—D. Slater.

Patents Sealed.

2261. G. Howell.	2306. L. F. Chezaud and H. J. Christen.
2264. J. Fox.	2321. W. B. Robins.
2267. J. Cox.	2326. R. Wallis.
2268. J. Rahill.	2327. R. Ridley and J. G. Jones.
2269. A. Watson.	2333. J. Renshaw & J. Haworth.
2276. J. M. Tate.	2343. W. and J. Galloway.
2294. W. Lorberg.	2405. F. Reid.
2305. V. Houghton.	2901. I. Francis.

From Commissioners of Patents Journal, March 15th.

Patents Sealed.

2283. F. de Wildé.	2341. J. Platt.
2291. J. Roberts and R. Naylor.	2371. J. Spence.
2292. R. D. Dwyer.	2373. L. H. Norris.
2295. I. Baggs.	2385. F. Preston.
2297. J. M. Cook.	2471. J. Spencer.
2299. H. W. Hart.	2511. T. C. Craven.
2303. W. Smith.	2823. W. E. Newton.
2315. T. Richardson, J. J. Lundy, and R. Irvine.	3038. C. Cammell and W. Crompton.
2318. J. Farmer and C. Hadfield.	3209. C. Bolton.
2325. F. A. Chatel.	46. G. Mead.
2328. G. T. Bousfield.	114. J. Howard, E. T. Bousfield, and J. Pinney.
2329. C. T. Burgess.	213. A. Brown, L. G. Kniffen, and T. H. Dodge.
2334. G. M. de Bayelt and J. E. Vigoulete.	
2336. C. Maitland.	

Patents on which the Stamp Duty of £50 has been Paid.

593. J. Jacob.	637. E. T. Truman.
597. J. Bunnett.	638. E. A. Pontifex.
608. A. Aerts.	

Patents on which the Stamp Duty of £100 has been paid.

675. C. Sharp.	698. W. C. Day.
694. F. A. Fitton.	702. R. L. Jones.
717. W. E. Newton.	

Registered Designs.

Spring joint for the frames of purses, bags, and similar articles—4622—March 7—Messrs. Wagner and Gustley, 31, Lawrence-lane, E.C.
Case or holder for a hair brush—4623—March 8—Walter T. W. Jones, 22, Hollis-street, W.
Combined tobacco stopper, pricker, and cigar holder—4624—March 9—Wm. and Cornelius Devonport, Birmingham.
Gas globe expanding clip—4625—March 9—Jno. J. Taylor, 55, New Bridge-street, Manchester.
Shaft guards—4626—March 11—Wm. Falley, Bletchley, Buckinghamshire.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, MARCH 25, 1864. [No. 592. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

MARCH 30.—"Artificial Light and Materials Used for Lighting." By B. H. PAUL, Esq.

APRIL 6.—"On the Principles of Imitation as Applied to the Decorative Arts." By THOMAS PURDIE, Esq.

CANTOR LECTURES.

Six lectures on "Chemistry applied to the Arts" will be delivered by Dr. F. CRACE CALVERT, F.R.S., F.C.S., corresponding member of the Royal Academy of Turin, of the Société Industrielle de Mulhouse, of the Société Imperiale de Pharmacie de Paris, &c., on Thursday evenings, at 8 o'clock, as follows:—

MARCH 31.—LECTURE I.—BONES.—Composition of raw and boiled bones. The manufacture of superphosphate of lime. Application to agriculture. Bone-black or char, and their use in sugar refining. *Phosphorus*, its properties, extraction and employment in manufacture of matches. *Horn* and *ivory*, their composition and applications.

APRIL 7.—LECTURE II.—GELATINE, GLUE, BONE-SIZE CHONDRINE, their preparation, chemical properties, nutritive value, and application to arts and manufactures. Artificial tortoiseshell. *Isinglass*, its adulterations and adaptations to clarification of fluids. *Skins* and the art of tanning.

APRIL 14.—LECTURE III.—LEATHER.—The art of the currier. Morocco, Russia, and patent leathers. The art of tawing skins. Chamois and glove skins. Parchment. *Hair*, its composition and dyeing. *Wool*, its washing, scouring, bleaching, and dyeing. *Silk*, its adulterations and conditioning.

APRIL 21.—LECTURE IV.—ANIMAL FATTY MATTERS, the various processes for liberating them from the tissues in which they are contained. Their composition and conversion into soap. Composite candles. The refining of lard. *Cod-liver*, *sperm*, and other oils. *Spermaceti* and *wax*.

APRIL 28.—LECTURE V.—FLESH, its chief constituents, boiling, roasting, and preservation. *Animal black*, its manufacture and applications. The employment of animal refuse in the manufacture of *prussiate of potash*. *Prussian blue*. Manufacture of artificial animal manures.

MAY 5.—LECTURE VI.—ANIMAL LIQUIDS.—*Bile*, its purification and detergent properties. *Blood*, its application in the refining of sugar and the manufacture of albumen. *Albumen*, its use in calico printing and photography. *Urine*, its uses. *Milk*, its composition properties, falsification, and preservation. A few words on putrefaction.

Proceedings of the Society.

CANTOR LECTURES.

FINE ARTS APPLIED TO INDUSTRY. BY W. BURGES, ESQ

SEVENTH LECTURE, MONDAY, MARCH 21.—THE WEAVER'S ART.

On Monday night, Mr. Burges, in delivering the concluding lecture of his series, began by stating how different costumes required different treatment in the designs of the fabrics which composed them, and after giving a short account of the principal features of the costume in the middle ages he showed how, in spite of the perishable nature of all fabrics, we had sufficient materials for the history and for the illustration of those of the middle ages, thanks to the mass of documentary evidence and to the custom of burying distinguished persons in their official robes, and of wrapping up reliques in precious stuffs. It appeared that in the first instance the production was monopolised by Byzantine and the Eastern nations; it then extended to Sicily and Venice, to Italy and the rest of Europe, thus accounting for the prevalence of entire inscriptions on earlier specimens, and for the imitation of them much later. The gradual increase of the diaper or pattern was another curious peculiarity, the stuff composing the robe of the Emperor Henry VI., preserved in the duomo at Palermo, exactly resembling the Indian kincob. Allusion was made to the very excellent series of specimens of ancient stuffs at South Kensington, where the increase of the patterns was distinctly shown from the somewhat large diapers of the 14th century down to the great pine patterns of the latter end of the 15th century, resplendent with gold thread and crimson velvet. The lecturer next touched upon the Indian productions, of which some choice specimens had been lent by Dr. Forbes Watson, from the Indian museum. Attention was particularly directed to the beautiful kincobs, the Delhi embroidery, and the exquisite combinations of colour in the Cashmere shawls, as well as to the excellent work about to be produced by Dr. Watson at the government expense, which would contain specimens of a great quantity of Indian fabrics, each copy consisting of no less than 20 volumes. The Persian and Turkish carpets formed the next part of the subject, and were commended for their colours as well as for the excellence of the materials; and a reproduction of a mediæval carpet by Mr. Fisher, from a pattern of Van Eyk's, was favourably noticed as giving us a great addition to the floor coverings of our apartments. With regard to our modern productions, regret was expressed that from the nature of our present costume there should be no better scope for the colours in the fabrics made for our dresses, but at the same time it was remarked that there were stuffs devoted to other uses, which offered an almost unlimited field, such as damasks, chintzes, brocades, stuff for the table, as napkins; and for the beds, as counterpanes; coverings for chairs and other furniture, to say nothing of carpets and rugs. Mr. Crace was fortunate enough to secure the services of the late

Mr. W. Pugin, and some of the fabrics made from his designs, more especially what was called the tapestry, left very little to be desired; the only fault that could be noticed being the animal on the chintzes, which had been conventionalised after the fashion of the 15th century, instead of that of a purer period of art. The lecturer concluded his task with a few remarks concerning our future progress in art. According to him the development will probably arise from our domestic architecture, political circumstances rendering it doubtful whether either public or ecclesiastical architecture will again exercise so much influence as they have done in other periods of the world's history. The great helps to improvement were then enumerated. 1. The better education of the designer by a more extended teaching of the figure. 2. Of the public at large, by bringing art collections, if not to their doors, at all events within their daily walks. 3. A wiser system of expenditure with regard to our public monuments. 4. A greater encouragement of the fine arts of painting and sculpture in our ecclesiastical buildings; and 5. the abolition of the law of leasehold. The walls of the room were covered with a large collection of modern fabrics, lent by Mr. Crace, with sundry pieces of embroidery and carpets by Messrs. Harland and Fisher; and finally, some exquisite specimens of Kincob-Indian embroidery and Cashmere shawls, most kindly lent from the Indian Museum by the courtesy of its curator, Dr. Forbes Watson.

The Chairman (Mr. Hawes), after noticing the very crowded attendance at Mr. Burges's lectures, and inferring, therefore, that the members of the Society approved the mode in which the Council had appropriated the proceeds derived from Dr. Cantor's legacy, said that this being the concluding lecture of Mr. Burges's course, he would ask the audience to thank the lecturer for the careful manner in which he had brought before them so interesting and important a subject as "Art applied to Industry," though with some of the views expressed as to the inferiority of modern as compared with ancient art industry, he (the Chairman) could not himself agree. He particularly wished, on behalf of the Council, to thank the gentlemen who, by the loan of many very valuable illustrations for each lecture, had contributed so much to increase the interest of the course.

Proceedings of Institutions.

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INSTITUTION OF NAVAL ARCHITECTS.

The annual meeting was held at the House of the Society of Arts, commencing on the 17th inst. The proceedings opened by the annual report of the Council being read by the Secretary.

Sir JOHN PAKINGTON, the President, then addressed the meeting. After some congratulatory remarks on the satisfactory character of the report and progress of the institution, the right hon. baronet paid a deserved compliment to the foresight of the gentlemen who chiefly assisted in the foundation of the Society at a time when the introduction of a new class of ships was changing the science of naval architecture to its very foundations. The president then adverted to the important paper read last year by Mr. Scott Russell, on the re-establishment of a School of Naval Architecture, especially contrasting the advantage possessed by Frenchmen over the English student of this subject, so important to a maritime country. Sir John went on to describe the communications which had passed on the subject between himself and the Lords of the Admiralty, and spoke with great satisfaction of the comparative certainty which now existed of the establishment of a School of Naval Architecture, in which the constructors of the Royal Navy and mercantile marine should be fairly represented, both in the direction of the institution, and in the benefits to be derived from it, while the general presidency of the school would remain, as it ought, with that department of the State which (as the chief shipbuilder of this maritime country) all must acknowledge as the most fit and proper to take the control and to exercise power and superintendence in an institution of this kind. The president had been requested to put a question to the government in the House of Commons on the subject, but after he had given notice of it, he received a most satisfactory letter from the Committee of Council on Education which rendered it unnecessary to put the question. In compliance with the request contained in it, the Council had re-appointed the gentlemen who formed the committee on this subject last year, to enter into communication with Dr. Woolley and Captain Donnelly. The next question alluded to was that of the building of iron-clad vessels of war. The right hon. gentleman took the opportunity of emphatically contradicting certain statements which had been imputed to him, to the effect that he had boasted of the *Warrior* on the express ground that that ship was imperfectly and partially plated. He thought no one would give him credit for being so absurd as to suppose that ships completely plated were not preferable to vessels imperfectly protected. But he pointed out that at the time the *Warrior* was laid down there was no certainty that a seaworthy vessel could be constructed with complete plating from stem to stern, and in so novel, anxious, and costly an experiment, the designers had not ventured to risk the success of the trial by loading her stem and stern with heavy armour. But while there was no certainty that this could be done, the right hon. baronet had never ventured to prophecy that no completely plated ships could ever be constructed. His impression still was, however, that this is a very doubtful problem, and he was disposed, even at this moment, to think it likely that the ultimate solution of the problem would be that ships might be plated throughout, but that the plating of the stem and stern would probably be of a lighter character than that of the central parts of the ship. Sir John Pakington then gave a most emphatic disclaimer of having ever spoken with any intentional slight of his friend Mr. Reed. If there were any slight whatever to that gentleman, it was due to the accidental circumstance that Sir John did not allude to him at all. The right hon. baronet added a compliment to the present Board of Admiralty on the courage which they had shown in not shrinking from experiment on account of the risk of failure. The President then called attention to some resolutions of the Council passed with a view to regulate the business of the meeting in such a manner as to enable the great number of papers communicated to it to be satisfactorily read and discussed in the limited time at its disposal, and ended by moving the re-appointment of the officers of the institution.

The motion was put and carried unanimously.

Then followed the reading and discussion of the papers. Abstracts of some of these will appear in a future number of the *Journal*. At present the abstract of one of them only is given, the subject having occupied so prominent a place in the President's address, and being one of special interest, owing to the proposal on the part of the Government to establish a School of Naval Architecture.

ON THE EDUCATION OF NAVAL ARCHITECTS. BY THE REV. JOSEPH WOOLLEY, LL.D., VICE-PRESIDENT.

After giving a brief account of the early history of the first application of scientific education in this country to the art of naval construction, from the time of "Master Phineas Pett," in the beginning of the 17th century, and calling attention to the marked superiority of vessels of French build over those of English construction, due to the superior care taken by the French Government to employ the highest scientific skill in the construction of these great works of art—quoting the statements of Mr. Creaze, in the "Encyclopædia Britannica," that this superiority was so well recognised that vessels captured from the French passed at once into the English navy, while those of English build captured by the French were thought too bad for theirs. Dr. Woolley spoke strongly of the ill effects which had resulted from the instinctive feeling so long prevalent in this country against the application of theoretical knowledge to practical construction. He then proceeded to give a brief account of the two Schools of Naval Architecture, one of which had been established in 1811, and abolished in 1832, and the other established in 1848, and broken up in 1853. Discouraged and eventually destroyed by the dislike and suspicion of the uneducated members of the profession, these establishments had turned out scholars whose thorough professional training and theoretical knowledge had enabled them, in spite of every drawback, to take leading positions both in the yards of private builders and even in the public service, among those very men whose jealousy had brought about the discontinuance of the system which had produced them. It was on the scholars from the earlier of these schools that the Admiralty had to depend in the re-construction of the navy, consequent on the introduction of steam; and pupils of the later establishment were now among the foremost in the building of those iron-clad vessels which now seemed our most reliable defence at sea. Dr. Woolley mentioned that in the school of naval construction of 1848-53, of which he was the head, he attempted to open the whole range of mathematical and theoretical studies, so far as they could in any degree have a bearing on the problems to be solved by the naval architect, and the school was, to all intents and purposes, a school of naval architecture. The study of the practical parts of a shipbuilder's work was, of course, placed in other hands. Of this he would only say that the opportunities obtainable in Portsmouth dockyard were such as should have turned out accomplished practical shipwrights—but Portsmouth and all other dockyard towns were and still are wanting in one great requisite—efficient *practical* instruction in physics, chemistry, metallurgy, and the like, which require an ample supply of expensive material for their illustration. Dr. Woolley then reverted to the absolute necessity of using the highest scientific skill in the construction of our ships. "No doubt," he said, "other things being equal, the courage and pluck of the British seaman may be relied upon to ensure success, but since the application of steam power to the propulsion of ships, and the mechanical inventions of all kinds which have been introduced, it is not, I think, too much to assert that the country which in future naval wars shall possess ships on the best models, with the best sea-going qualities, the most securely defended against attack, and the most powerful

in the means of offence, will possess advantages which no amount of skill and courage will be able to countervail." Dr. Woolley then proceeded to describe the kind of instruction which the modern students of naval architecture needed to receive :—A thorough grasp of all those mathematical and physical studies (many of them of a very high order) which enter into the principles of the construction and behaviour of vessels—not a superficial acquaintance with rules and formlæ, and a trick of applying for their own purpose the result of other men's work, but a thorough comprehension and command of their subject, so that they might be able to think independently upon it, and make this thought take a practical form in their designs. On the other hand, it was no less indispensable that they should have a thoroughly practical training in the actual work of a dockyard, so as not only to gain a complete knowledge of the nature and use of the tools employed, but also that they should learn how work should be begun and carried on, so that they might both direct others how to set about it properly, and might know what may and what may not be expected from those employed under their superintendence. They must also be skilful draughtsmen and expert calculators. Dr. Woolley pointed out that by the plan proposed, of pursuing the theoretical studies during the winter in London, and then giving the scholars some months of unbroken practical work in the dockyard in the summer, when the hours of daylight and of work were longest, and the season of the year most fitted for out-door labour, they would have really better opportunities of learning practical shipbilding, and would be more useful in the yards than by the daily alternation of labour and study followed in the former School of Naval Construction. For all the theoretical part of this instruction Dr. Woolley remarked that there was no place in this country where it could be obtained so readily and so cheaply as in London. In no other town were there such facilities for attending lectures on physics, frequently needing expensive materials for their illustration—nowhere else was it possible, at any reasonable cost, to secure the services of the ablest men of the day as lecturers and teachers. In Dr. Woolley's opinion these considerations were conclusive in favour of a metropolitan school, to say nothing of the accidental advantage of breaking the monotony of a dockyard life—bringing the student into an atmosphere charged with science,where he would be surrounded on all sides by objects which appealed to his sense of the beautiful,where he might spend his leisure moments among the models of former patented inventions, and make himself acquainted readily and in the most effective manner with their several contrivances and uses, where he might almost unconsciously imbibe the best practical lessons in machinery, and the adaptation of simple mechanical means to desired ends.

SOUTH LONDON WORKING CLASSES INDUSTRIAL EXHIBITION.

The distribution of prizes to the successful competitors at this exhibition took place on Thursday evening the 17th of March. The chair was taken by Mr. Samuel Morley, who opened the proceedings by calling on Mr. Murphy, the secretary, to read the report. From this it appears that the exhibition has been most successful, both as to the number of exhibitors and the attendance. During the nine days it was open it was visited by no less than 30,000 persons, and the money taken at the doors is said to have been more than sufficient to cover the expenses. The entrance fees and the sale of a few small articles have realised the sum of £288.

The Chairman congratulated the exhibitors on the success the scheme had met with. He felt assured from what he had seen that there was a large amount of latent intelligence and genius among the masses of the population, which only wanted bringing out by means like the present. The temperance movement had a great deal to do with the success of this exhibition, for the time which the men had hitherto spent in publichouses was now devoted to the designing and manufacture of the useful and artistic objects with which they were surrounded. Numerous well-meant attempts had been made to force on the working classes schemes with which they could have no sympathy, but the numerous articles exhibited, and the large number of visitors plainly showed that this was a matter into which the working men threw themselves heart and soul. He concluded by urging the exhibitors to exert their influence on their friends, to induce them to join in similar occupations.

Mr. Washington Wilks, in referring to the very gratifying experiment that had been made, said that the self-elevation of working people was promoted by the useful or thoughtful employment of their spare time. Habitual work did not require much thought, and it was only when a man employed himself at some occupation to which he was totally unaccustomed that his mind became expanded. The articles exhibited were not all first-rate, but they had not been made with the idea of being exhibited or rewarded. Now that the idea was fairly started he expected that when the men knew that the articles they made would be submitted to the scrutinizing gaze of the public, and to the competition of their fellow labourers, they would take infinitely more pains in perfecting them.

The Chairman proceeded to distribute the prizes, which consisted of chromo-lithographs, framed and glazed, inscribed with the name of the exhibitor, and giving a short description of the articles for which the award had been given. They were divided into four classes of merit—first-class, second-class, highly commended, and commended. When the whole had been distributed the chairman said he had the satisfaction of informing them that their good example had already been followed, for the working men of the east end of London had commenced a similar industrial exhibition. The proceedings concluded by the presentation of an address from the exhibitors to Mr. Murphy, the secretary. It was written by James Durrant, a tinplate-worker. During the evening a large chamber organ, the work of Charles Meachim, a journeyman carpenter, performed a number of popular airs.

RESULTS OF POSTAL REFORM.

As Sir Rowland Hill has just retired from his duties as Secretary of the Post Office, it would appear to be a fitting time to call attention to the results of those reforms which he was so active in introducing, and the more important organic improvements which he effected, as follows :—

A very large reduction in the rates of postage on all correspondence, whether inland, foreign, or colonial. As instances in point, it may be stated that letters are now conveyed from any part of the United Kingdom to any other part—even from the Channel Islands to the Shetland Isles— at one-fourth of the charge previously levied on letters passing between post towns only a few miles apart ;* and that the rate formerly charged for this slight distance—viz., fourpence—now suffices to carry a letter from any part of the United Kingdom to any part of France, Algeria included.

The adoption of charge by weight, which, by abolishing the charge for mere enclosures, in effect largely extended the reduction of rates.

Arrangements which have led to the almost universal resort to prepayment of correspondence, and that by means of stamps.

The simplification of the mechanism and accounts of the department generally, by the above and other means.

* When Sir Rowland Hill's plan was published the lowest general post rate was fourpence, but while the plan was under the consideration of Government the rate between post towns not more than eight miles asunder was reduced from fourpence to twopence.

The establishment of the book-post (including in its operation all printed and much MS. matter), at very low rates, and its modified extension to our colonies, and to many foreign countries.

Increased security in the transmission of valuable letters afforded, and temptation to the letter-carriers and others greatly diminished, by reducing the registration fee from 1s. to 4d., by making registration of letters containing coin compulsory, and by other means.

A reduction to about one-third in the cost—including postage—of money orders; combined with a great extension and improvement of the system.

More frequent and more rapid communication between the metropolis and the larger provincial towns; as also between one provincial town and another.

A vast extension of the rural distribution—many thousands of places, and probably some millions of inhabitants, having, for the first time, been included within the postal system.

A great extension of free deliveries. Before the adoption of penny postage many considerable towns, and portions of nearly all the larger towns, had either no delivery at all, or deliveries on condition of an extra charge.

Greatly increased facilities afforded for the transmission of foreign and colonial correspondence; by improved treaties with foreign countries, by a better arrangement of the packet service, by sorting on board, and other means.

A more prompt despatch of letters when posted, and a more prompt delivery on arrival.

The division of London and its suburbs into ten postal districts—by which, and other measures, communication within the twelve miles circle has been greatly facilitated, and the most important delivery of the day has, generally speaking, been accelerated as much as two hours.

Concurrently with these improvements, the condition of the employés has been materially improved; their labours, especially on Sunday, having been very generally reduced, their salaries increased, their chances of promotion augmented, and other important advantage afforded them.

Sir Rowland Hill's pamphlet on "Post-Office Reform" was written in the year 1836. During the preceding twenty years—viz., from 1815 to 1835, inclusive—there was no increase whatever in the Post Office revenue, whether gross or net; and, therefore, in all probability, none in the number of letters: and though there was a slight increase in the revenue, and doubtless in the number of letters, between 1835 and the establishment of penny postage, early in 1840—an increase chiefly due to the adoption of part of Sir R. Hill's plan, viz., the establishment of day mails to and from London—yet, during the whole period of twenty-four years immediately preceding the adoption of penny postage, the revenue, whether gross or net, and the number of letters, were, in effect, stationary.

Contrast with this the rate of increase under the new system which has been in operation during a period of about equal length. In the first year of penny postage the letters more than doubled; and though since then the increase has, of course, been less rapid, yet it has been so steady that, notwithstanding the vicissitudes of trade, every year, without exception, has shown a considerable advance on the preceding year, and the first year's number is now nearly quadrupled. As regards revenue, there was, of course, a large falling off—about a million in gross, and still more in net revenue. Since then, however, the revenue, whether gross or net, has rapidly advanced, till now it even exceeds its former amount; the rate of increase, both of letters and revenue, still remaining undiminished.

In short, a comparison of the year 1863 with 1838 (the last complete year under the old system) shows that the number of chargeable letters has risen from 76 millions to 642 millions; and that the revenue, at first so much impaired, has not only recovered its original amount, but risen, the gross from £2,346,000 to about £3,870,000, and the net from £1,660,000 to about £1,790,000.*

The expectations held out by Sir R. Hill before the change were, that eventually, under the operation of his plans, the number of letters would increase fivefold, the gross revenue would be the same as before, while the net revenue would sustain a loss of about £300,000. The preceding statement shows that the letters have increased, not fivefold, but nearly eight and a half fold; that the gross revenue, instead of remaining the same, has increased by about £1,500,000; while the net revenue, instead of falling £300,000, has risen more than £100,000.

While the revenue of the Post Office has thus more than recovered its former amount, the indirect benefit to the general revenue of the country arising from the greatly increased facilities afforded to commercial transactions, though incapable of exact estimate, must be very large. Perhaps it is not too much to assume that, all things considered, the vast benefit of cheap, rapid, and extended postal communication has been obtained, even as regards the past, without fiscal loss. For the future there must be a large ever-increasing gain.

The indirect benefit referred to above is partly manifested in the development of the Money Order system; under which, since the year 1839, the annual amount transmitted has risen from £313,000 to £16,494,000; that is, 52 fold.

An important collateral benefit of the new system is to be found in the cessation of that contraband conveyance which once prevailed so much that habitual breach of the postal law had become a thing of course.

It may be added that the organisation thus so greatly improved and extended for postal purposes stands available for other objects; and passing over minor matters, has already been applied with great advantage to the new system of Savings Banks.

Lastly, the improvements briefly referred to above, with all their commercial, educational, and social benefits, have now been adopted, in greater or less degree—and that through the mere force of example—by the whole civilized world.

Manufactures.

Steam Boiler Explosions.—The chief engineer's report to the Manchester Association, for the months of January and February, says that the ordinary visits of inspection have been made, 2 boilers tested by hydraulic pressure, and 307 defects discovered in the boilers examined, 10 of which were dangerous. A blister, measuring 24 inches by 12 inches, and three-sixteenths of an inch in thickness, was met with inside an internally-fired boiler, 8 feet in diameter, and working at a pressure of 45lbs. on the square inch. In two boilers, though only eighteen months old, the plates, which had been seven-sixteenths of an inch thick originally, were found to be eaten half through, while the rivet heads also were attacked. The feed water used was drawn from a well. In another boiler, which was of Lancashire construction, and fed from the Rochdale canal, the furnace crowns presented a spongy appearance, and channelling had set in at the transverse seams, which is unusual in internal flue tubes; also the rivet heads and angle irons were attacked. Internal corrosion had been successfully arrested, in many cases, by the use of carbonate of soda, introduced in small and frequent quantities with the feed water. Two waggon boilers were found to be so corroded along the brickwork seating that holes could be

* In this comparison of revenue, the mode of calculation in use before the adoption of penny postage has of course been retained—that is to say, the cost of the packets on the one hand, and the produce of the impressed newspaper stamps on the other, have been excluded. The amounts for 1863 are, to some extent, estimated, the accounts not having as yet been fully made up.

scraped through the plates. Two Lancashire boilers, set upon side walls, were found to be seriously corroded at the seating, in consequence of water, arising from the discharge of the safety-valves, &c., being allowed to fall upon them. Two other instances occurred to Lancashire boilers, in consequence of their being set upon mid-feather walls. Four cases of external corrosion occurred at the bottom of the shells of internally-fired tubular boilers, on account of the unequal expansion of the metal, consequent on the imperfect circulation of the water. The constant straining induced by this unequal expansion had produced leakage at the transverse seams, and thus corroded the plates. In such cases caulking is of little use. The only radical cure is to maintain the whole of the shell at an equal temperature, and this, in many cases, has been found to be sufficiently accomplished by carrying a return flue under the bottom of the boiler. Two other cases arose from leakage at the tube ends of multitubular boilers, from which the plates at the bottom of the combustion chambers were nearly eaten through. Some instances of pressure gauges out of order, and giving wrong indications, were met with. From the commencement of the present year up to February 19th, six explosions had occurred, from which twenty-five lives had been lost, and many persons injured. Not one of the boilers in question was under the charge of the Association. In one instance the feed pipe was found, upon examination, to have become choked with ice. This cut off the supply to the boiler, and it consequently exploded from shortness of water. In another case the boiler was 6 years old, the length being 31ft. 8in., its diameter 7ft., and the original thickness of the plates from three-eighths to seven-sixteenths of an inch, but considerable corrosion was proved to have taken place. In a third instance the water in the pipes had frozen, and thus the outlets became choked, and the steam pressure bottled up, so that on the fire being maintained for a sufficient time explosion became inevitable from accumulated pressure. Every boiler employed for heating and ventilating public buildings, as well as those for household purposes, should be fitted with an efficient mechanical safety valve, which would remain unaffected by changes of temperature. The importance of this with regard to domestic boilers is too apt to be overlooked.

Commerce.

Pattern Post to Malta, Gibraltar, Alexandria, Cairo, Suez, and Constantinople.—On the 1st April next, and thenceforward, patterns of merchandise, similar to those already transmissible by post between any places in the United Kingdom, at reduced rates, may be transmitted by post between England and Malta, Gibraltar, Alexandria, Cairo, and Suez, by packet, *viâ* Southampton, at the following rates of postage, which must in all cases be pre-paid by postage stamps, viz.:—Not exceeding 4 ozs., 3d.; above 4 ozs. and not exceeding ½ lb., 6d.; above ½ lb. and not exceeding 1 lb., 1s.; above 1 lb. and not exceeding 1½ lb., 1s. 6d.; above 1½ lb. and not exceeding 2 lbs., 2s.; every additional ½ lb., 6d. Similar arrangements have been made between England and Constantinople, *viâ* France, the rates of postage being as follows:—Not exceeding 4 ozs., 4d.; above 4 ozs. and not exceeding ½ lb., 8d.; above ½ lb. and not exceeding 1 lb., 1s. 4d.; above 1 lb. and not exceeding 1½ lb, 2s.; above 1½ lb. and not exceeding 2 lbs., 2s. 8d.; for every additional ½ lb., 8d.

Canals in America.—A New York paper states that the estimated cost of the ship canal around Niagara Falls is five millions and a-half dollars. It is proposed to build it with locks 300 feet long, 50 feet wide, and 10 feet deep. In addition to this, three millions and a-half dollars will be asked for the Oswego and Erie canals, and four millions for a canal from the St. Lawrence over to Albany, *viâ* Lake Champlain, and thirteen million dollars for an enlargement of the Illinois canal from Keokuk to Chicago, so that vessels of 600 tons burthen can pass.

Cotton Cultivation in Italy.—A letter from Turin, in a Marseilles paper, says that the exhibition of Italian cotton, recently opened at the museum of that city, deserves to be pointed out to all friends of economic progress in Italy. Notwithstanding the short time which the minister of agriculture and commerce and the commissioners appointed by it had to organise this exhibition, the results obtained show in the most convincing manner that this valuable production needs not henceforward to be wanting in Italy. The number of exhibitors amounts to 208, divided over 38 provinces, and representing 113 communes extending from Como, and Brescia, as far as the most distant ones in Sicily. Each lot of cotton is accompanied by an explanatory note showing the name and address of the exhibitor, the name of the commune and of the province, the nature of the soil, the mode of cultivation, and the agricultural implements made use of.

Petroleum.—The report of the Commissioners appointed by the Navy Department of New York, consisting of three chief engineers, who have made careful experiments for five months, as to the practicability of using petroleum or hydrocarbon oils for the purpose of generating steam, has been issued, and proves satisfactory. It is alleged that its use will be a great saving, not only for merchant steamers, but that a naval steamer using it can keep the sea under steam three times as long with less labour and greater economy as compared with an equal weight of coal.

Folding Boat.—A partial trial was recently made at Portsmouth dockyard of a folding boat, intended by the inventor for use with troop or emigrant ships. The boat is flat-bottomed, with pointed ends, and will carry fifty people at a very light draught of water. In receiving passengers from any ship under circumstances of abandonment at sea, it would be required to be heavily weighted in addition to its human freight, in order to make it safe. Its principal merits appear to be the very small space a number of boats would occupy when folded up, and stowed away on board ship, and the large amount of boat accomodation which would thus be available in the event of disaster.

Silk.—The exports from China are falling off; from the great seat of export, Shanghai, only 39,245 bales were shipped last year against 84,983 bales in 1862.

Paper.—The supplies of foreign paper are largely on the increase since the abolition of the duty—133,401 cwt., valued at £288,761, were received last year, against 61,106 cwt. of the value of £96,550 in 1861. France last year supplied us paper of the value of £49,609, and Belgium 159,000. The import of rags for paper-making last year was 45,448 tons, or nearly double the amount of the previous year's imports, besides the enormous quantities of Esparto fibre, tow, and waste of flax, jute cuttings, and other substances, brought in for the use of the paper-maker.

An Exhibition of manufactures and arts has been held at Lahore, and with great succeess.

An Act for the prevention of the Adulteration of Cotton in the Bombay Presidency came into operation on the 1st of February.

The Exports from France during the month of January last exceeded those of the preceding January by upwards of 34,000,000f., of which a great part was supplied by the manufacturers of Paris and the neighbourhood. The diminution in the exports to the United States is more than compensated for by the increased demand from almost every other country. Great activity prevails throughout the ironworks, manufactories, and workshops of Paris.

Woollen Trade in France.—Since raw cotton has attained so high a price, and the import duty on wool has been reduced, but particularly since the commercial treaty with England and other countries has opened new markets for French industry, the woollen trade has greatly increased in France. In 1861 France exported only 188,000,003f.-worth of woollen cloths. The exportation

rose to 221,500,000f. in 1862, and last year the woollen cloths exported amounted in value to 283,000,000f., being an increase of 61,500,000f. over the year 1862, and of 95,000,000f. over 1861. Of 241,000,000 kilogrammes of wool imported into France last year, England supplied 17,249,604 kilogrammes; Rio de la Plata, 8,289,690; Turkey, 8,331,671; Germany, 5,703,459; Belgium, 3,643,282; Spain, 1,727,705; Algeria, 5,143,476; the Coast of Barbary, 3,454,101 kilogrammes. The export of woollen fabrics continues to increase. It amounted in the month of January last to 22,300,000f., against 17,300,000f. in January, 1863.

THE TRADE AND NAVIGATION ACCOUNTS for January last show that during the month 2,924 vessels, with a tonnage of 725,975 tons, entered our ports, and 2,762, with a tonnage of 769,210, cleared outwards. The tonnage in the corresponding month of 1863 was, inwards, 689,084, and outwards, 694,274. There were exported 568,851 tons of coal, valued at £270,160; cotton yarn, 4,748,054lb, value £630,211; cotton manufactures to the value of £293,314. The imports of cotton were 81,639 cwts.; tea, 7,694,539lb.; sugar (unrefined), 553,145 cwts.

Colonies.

THE RUST IN THE WHEAT, at one time considered to be confined to the coast territory (in New South Wales), has made its appearance inward. The exact cause of the blight is still a mystery, but the upper lands are more free from it than the lower. It has been almost universal along the coast.

NEW SOUTH WALES.—The estimates of the probable expenditure have been lately laid upon the table of the Assembly. The amount required for the year 1864, to defray the expenses of the Schedules, the Executive and Legislative, and the other departments of the Government, is £1,584,957; for special appropriations, £341,500—total, £1,926,457. Under the head of loans, the sum required is, £451,127, £234,827 of which amount is to cover excess on votes taken in the years 1855 and 1857, 1858, and 1860, for the extension of the northern, southern, and western railways to Singleton, Picton, and Penrith. The balance to be raised by loans is for harbour and navigation, roads and bridges, public works, and electric telegraphs.

SYDNEY FREE TRADE AND DIRECT TAXATION LEAGUE.—An association under the above title is in progress of formation in Sydney, by several intelligent mechanics. At an early date their principles of action will be laid before the public, and lectures upon free trade, as opposed to protection of native industry, will be delivered in Sydney, and ultimately in other parts of the colony.

SYDNEY.—BAR IRON.—A quantity of bar iron, the finest of the Fitzroy Iron Works, at Mittagong, has arrived in Sydney.

INDUSTRIAL LEAGUE IN SYDNEY.—A meeting, called by the secretaries of the League for the Promotion of Colonial Industry, was held in December last, in the Masonic Hall, for the purpose of expressing approval of the proposed new tariff recently submitted to Parliament. There was a numerous assemblage.

EXPLORATION IN NEW ZEALAND.—A discovery has just been made in the middle island of New Zealand which is likely to be of considerable value in aiding the development of the resources of the Otago. Everything that tends to facilitate communication between the principal places of settlement must be regarded as a gain to the community, and though existing interests may suffer for a while by the diversion of traffic in the opening up of new routes, the result, in the long run, must prove beneficial. Dunedin, Invercargill, and Riverton have hitherto been the rival ports which sought to obtain the trade of the lake district, this being the most important part of the trade, inasmuch as it includes the gold brought down from the gold fields. If the discovery which Dr. Hector has made should be verified by subsequent researches, it will be found that the gate to these gold fields will be no longer by the ports just named, but that they may be reached with greater facility from the west coast. On some of the maps of the middle island the course of a river is traced from the lakes to the sea in the neighbourhood of Milford Haven. A native track is marked which had been, no doubt, used at some time or other by the few natives who still linger about the west coast, or by their forefathers. There is good reason to believe that this river and this track have been now traversed by Dr. Hector, but be this as it may, there is no doubt that the auriferous lands on the borders of Otago and Canterbury, and along the line of lakes that extend thence southwardly by west, can be readily approached from the west coast. If this be so it is more than probable that a rival port will spring up either in Milford Haven or Martin's Bay, at the mouth of the river, which the explorer has named Kadaku, or on the lake, to which he has given the appellation of Kakapo. Such a port would be within three or four days' steaming from Melbourne, and in a track less subject to violent winds than the course through Foveaux Straits. Some time since Dr. Hector sailed from Port Chalmers in a small coaster, accompanied by a little band of explorers, to examine the west coast. It has long been supposed that one or other of the little known and seldom visited inlets of that unpeopled coast, if not a river, at least a practicable track would be found to the gold fields of the lake district. On his return from his explorations on the northern border of the province, this gentleman was charged with the attempt to discover whether such a means of access did really exist. According to advices recently received his efforts have been crowned with unexpected success.

WOOL TRADE IN NEW SOUTH WALES.—It is well-known that the high rate of freight renders it necessary to compress the bales into a much smaller space than is possible on a station. Formerly this was done by manual labour, the wool being stored in tents, and there being consequently delay and frequently injury. A leading firm at Sydney have recently erected stores capable of holding 5,000 bales, with five hydraulic presses, each working to a pressure of 200 tons, driven by a steam engine of about 10-horse power, and capable of turning out 500 bales a day in each store. The wool, after being pressed, is simply rolled and hoisted on board at once, by steam power, as in most instances the vessels go alongside the quay, but, should it be necessary, there are two lighters with steam lifting apparatus to take it out into the stream. These stores are each capable of pressing for six ships, and employ upwards of a hundred men.

ARROWROOT IN NEW SOUTH WALES.—A Sydney paper states that a very superior sample of arrowroot has been grown at Tomago on the Hunter. It appears that it has been manufactured in small quantities for the last four years. It was awarded the prize at the late Maitland Agricultural Show. This season between three and four hundred weight have been sold, some of which has been sent a considerable distance into the interior. Next season the growers expect to have a considerable quantity for the market, as they have now between eight and nine hundred plants. There seems to be every probability, from the improved machinery in use and other causes, that this article, which is at present largely imported, will, before long, become an export of the colony.

CO-OPERATIVE SOCIETIES IN QUEENSLAND.—Co-operative societies continue to prosper in this colony, and promise to become great social institutions there. One has lately been formed under the name of the Queensland Co-operative Cotton Growing and Manufacturing Company. It has been started under very favourable auspices, and already the company has purchased 640 acres of land. The Lancashire Co-operative Cotton Company have as yet faithfully carried out the promises made to the portion of the public that assisted them;

they have already about seven acres of cotton in, which is now two or three inches above the ground and looks very healthy; they have six acres more prepared for planting. In order to supply the wants of their little colony, they have planted two or three acres with English potatoes, and one acre with the sweet potatoe. They will probably be able to get in twenty acres of cotton this spring.

Obituary.

Richard Roberts, of Denbighshire, the instinctive mechanician, better known as Roberts of Manchester, the informing spirit of the wide-famed firm of Sharp, Roberts, and Co., has passed away, and his mortal remains lie in the Cemetery at Kensal-green. How much this one man did for the material progress of England and the world, is known but to few, but, could the results suddenly disappear, all would be conscious how wide a gap would be left. The material profits of the world are represented by millions on millions of pounds sterling, accumulated and accumulating even while the blessing conferred on humanity, by substituting metallic drudges for living beings is overlooked. Inventive mechanicians in the highest sense are far from numerous—their faculty is as much a peculiar gift as that of the poet or musician, albeit in these latter days there be many who reckon invention to be a process as natural and inevitable as that of hens laying eggs. They mistake contrivance for invention, and would consider the scooper out of a cavern in a sandstone rock for purposes of shelter, to be on a par with the architect of the Parthenon or of York Minster. Richard Roberts possessed emphatically the gift of invention, not mere improving in a fixed track, but the power of imagination to convert matter generally to human uses, by changing its form and variously combining it; this faculty is the basis of all engineering in the higher sense, doing that which has not been done before, and also doing it well and usefully. Imitating what has been done before is the process of the builder and constructor, rather than that of the engineer. Richard Roberts began his career as pattern-maker to a millwright, in the days when engineers were unknown as a professional body. The word "pattern-maker," in its largest sense, is one of high import. It means the designer of a new form or type; in the technical meaning, it is one who copies accurately in wood or metal a design first presented in a drawing by the original designer. To do this work well requires precision of hand and eye, and in using hand and eye for others it was not long before Richard Roberts discovered that he had within him a well-spring of imagination fitting him to originate as well as execute. So he came to London, the metropolis of progress, and was one of those who helped in the workshops of Maudslay, also a self-educated man of his own kind. He was then, in the year 1814, twenty-five years of age. In the year 1817 he began to work for himself in Manchester, and turned his attention to the construction of machine tools. Skilled fingers, such as he himself possessed, were rare and costly, and no large amount of work could be executed by them. In mechanical engineering, plane surfaces, mathematically true, are an essential of success. These plane surfaces were produced by what was technically termed "chipping and filing," all executed by human hands. In dealing with a soft material such as wood, a joiner can produce plane surfaces with comparatively little labour, but in stubborn metal, skill of eye and hand needs also strength of muscle. So Richard Roberts devised a machine to form true planes on iron surfaces as freely as a joiner planes wood, and after that he made other machines to cut grooves, or square holes, or "mortices," in iron also, and to form true teeth on wheels and pinions. From that time forth he possessed metallic workers, needing neither eye nor hand, but only human attendants, to set them in operation. Metal henceforth became as pliant as wood had been before it, and iron began to supply the place of timber in machinery. In the year 1823, Richard Roberts had acquired a reputation that induced a capitalist, Thomas Sharp, to seek him and obtain him for a partner. There are qualities in most men which induce them to desire for themselves a monopoly of the things they are anxious to acquire, and at the same time to denounce all attempts at monopoly in others. About the year 1824 the dominant monopolists in Lancashire were the working spinners, who claimed, as they had a right to do, their own prices for labour, but they also claimed a right of excluding others from working. Upon this the mill-owners applied to Richard Roberts, the man of most mark in invention, to construct for them a self-acting mule, *i.e.*, a traversing frame, holding an enormous number of spindles for spinning thread, moving backwards and forwards by steam power, and only requiring the attention of a child or two to piece broken thread. When it was finished and at work, the mill owners wished to have it, and set it at work simply in terrorism, but Richard Roberts refused to be a mere tool to change the monopoly from men to masters. So it lay some time in abeyance, and meanwhile he devised a system of gauges and patterns to make all parts exactly alike, so that any part of one machine would fit any other machine. By the year 1830 the machine received many other improvements which perfected it, and millions on millions of spindles are now at work over the whole civilised world, each separate spindle doing more and better work than any five or six of the human beings—girls or women—known of erst as "Spinning Jennies." He then turned to locomotive engines, and some 1,500 have been constructed at their works during a term of thirty years. Then he turned to turret clocks, and devised the original system now largely employed by Dent. When the Conway bridge, with its millions of rivets, was about to be constructed, he devised a machine analogous to the Jacquard loom, for punching accurately the holes in the plates. This machine has since been used in the construction of the Boyne viaduct, the Victoria bridge at Montreal, and the Jumna bridge in India. In 1852 he turned his attention to steam ships, and, departing from all existing practice, he adopted two side keels instead of the usual central, and applied two screw propellors, one on each side, with separate engines, thus enabling vessels to turn round in their own length by setting the screws to work in opposite directions. This proposition, announced in 1852, has become an acknowledged practical fact only in 1864. And so passed away a long life of utility. As a matter of course, Richard Roberts patented his inventions. All Manchester would have wondered had he not done so, and nevertheless would have used his inventions without recognition if he had not protected them. It has become a wide-spread fashion at the present time to denounce patentees as monopolists, but on examination it will appear that the denouncers are simply would-be monopolists, capitalists who would put all competition out of the market but for the competition of new inventions. Doubtless the patentee inventor also aims at a monopoly, but it is in strong competition with the capitalist, whom he can only conquer by giving the public something better or cheaper. As a rule, the capitalist does not care what he makes or wastes so that he does it to his own profit. A Manchester manufacturer once remarked to an inventor, "You come at a wrong time. We never make improvements till profits get wiredrawn, and they are very good just now." Without protection for new manufactures or new ideas no manufacturer would make improvements, expending his money only to teach his neighbours new arts at his cost. It would be a fatal day to progress could capitalists succeed in making all ideas common property, and abolishing copyright in art, literature, and manufacturing invention. The glory would have departed from us. Inventors create

capital, not often for themselves. They gain it, and, if true inventors, expend it again. They are make-alls, not save-alls. The Arkwright class of psuedo-inventors, the men of business, are the great accumulators, and of great value to the nation, but they are commercial men, not producers in the true sense. The true inventor is never satisfied with the imperfect present while he can obtain a glimpse of a more perfect future. The established capitalist, with his red tape and his patterns all ticketed and docketed, hates this disturbing force, which interferes with all his existing arrangements, perchance "hindered him of half a million"—when his mill, with all the latest improvements, was just completed, brought forth another mill which could work five per cent. cheaper, by some new crotchet springing from a mechanical brain. Richard Roberts was a true inventor. Of the millions of capital he created for the world, he reaped thousands and expended them, and passed out of life at three-score years and fifteen, leaving behind him, unprovided for, his only daughter, who nursed him through his declining years, and prolonged his life by her cares. His funeral was a public one, provided by his friends in Manchester as a mark of their respect, and was numerously attended by his brother engineers, by many of his old workmen and pupils, and by a large number of eminent men in all walks of life. Richard Roberts was elected a member of the Society of Arts in 1860.

Notes.

DIAMAGNETIC ACTION OF WATER.—Professor Maas, of Namur, in a communication on this subject made to the Royal Academy of Sciences of Belgium, expresses his opinion that water is the determining cause of the diamagnetism of certain organised substances. He states that Faraday, in his work on magnetism, has ranged elder-pith and ivory among diamagnetic bodies. After having observed the diamagnetism of a small prism of elder, he was surprised to find it changed to para-magnetism a short time afterwards. In order to ascertain the cause, he cut from a long cylinder of oldish elder-pith two prisms, using a knife electrotyped with copper. One of these prisms was left exposed to the air, the other was inclosed in a flask containing some drops of distilled water. The first was found to be powerfully axial-magnetic, the other as powerfully equatorial. M. Maas hence concludes that the water made the latter diamagnetic. Several slices of ivory cut in different directions from an old piece equally surprised him, since none placed itself across the axis of the magnet; one placed itself axially; another made a very open angle with the same axis. A third example was a small cylinder composed of starch, gum arabic, and water. Freshly prepared it placed itself transversely, but when spontaneously dried it became para-magnetic. "Hence," says M. Maas, "we may be permitted to suppose that many natural organic substances owe their diamagnetic property to the interposition of liquids, of which water forms the larger proportion." The apparatus employed in the experiment was a Faraday's electro-magnet, modified by Becquerel, and constructed by Secretan.

SYRO-EGYPTIAN SOCIETY, March 8th, Samuel Sharpe, Esq., F.S.A., in the chair. J. T. Whitty, C.E., D.C.L., L.L.D., read a paper, being a brief statement of facts, enlarged upon in a work recently published upon "The Water-supply and Drainage of Jerusalem," a subject which is attracting a good deal of attention at the present moment, and to carry out which, by purely benevolent means, a society is in the act of being formed under high auspices.

ARTIFICIAL RAINBOW.—*Cosmos* states that Monsieur Duboscq has contrived for use in the French theatres a method of imitating the rainbow. He uses an electric light, obtained with the aid of 100 cells of Bunsen's battery. This rainbow is said to show brilliantly even when the whole stage is lighted up.

RUINS OF POMPEII.—Thanks to the present government of Italy, these remains can now be visited and studied with much greater satisfaction than formerly. On entering the city a fee, fixed by the State, of two francs, is paid by each visitor. The guides, forbidden themselves to receive anything, are to be known by their uniform. All the villas are kept swept, so that the beautiful mosaic pavements can be seen to great advantage without the visitor being troubled by the insatiable demands of innumerable sweepers as formerly, who were stationed at every vil'a. Fresh excavations are continually though slowly going on, an annual government grant being made for that purpose.

POPULAR LECTURES IN PARIS.—After several unsuccessful attempts, the English system of public lectures seems to have taken root in Paris. At an establishment in the Rue de la Paix there are discourses almost every evening in the week on various subjects, not political, by lecturers well known in the literary and scientific world, and a course is now in progress in another quarter of the city, the proceeds of which are to be devoted in aid of the unfortunate Poles. The most remarkable case is that of the opening of the theatre of the Sorbonne on two evenings a week for a like purpose; one of these is to be devoted to literature and the other to science, and, with the exception of a certain number of seats for ladies, for which tickets will be issued, these popular lectures in the hall of the University of Paris are offered gratis to the world. Excellent courses are given at the College of France, also public, but these lectures are delivered in the day time, when of course many persons are totally unable to attend. The Sorbonne has become, since the inauguration of the evening course there, a popular institution. On the evening of the first public lecture there were from a thousand to fifteen hundred persons at the doors more than the amphitheatre could contain; and the Minister of Public Instruction himself, under whose auspices this new movement has taken place, was, for some time, amongst the excluded. On the second evening better arrangements were made for ingress, but the size of the hheatre could not be increased, and, as on the former occasion, a vast number of persons were disappointed admission. The lecture, by M. Jamin, a very able manipulator, was on "The three Conditions of Matter"—solid, liquid, and gaseous, and the experiments were very well managed. On the third evening M. Lévêque lectured on "Poussin and French Art." The fourth evening was devoted to a discourse by M. Gratiolet, on "Man, and his position in Creation;" the next, to a lecture on "Voiture, and the Hôtel de Bambouillet;" and on the 21st inst., M. Wurtz will explain the "Phenomena of Combustion." The establishment in the Rue de la Paix has applied for permission to open a branch institution at the east end of the town, and it is said that applications have been made from several provincial towns for permission to establish similar courses of lectures. This is not the first, or even the second time, that the attempt has been made to popularise art, science, and literature in Paris, and it would be too much to say that success is now certain, but the experiment certainly promises well—at all events, for those courses to which the public are admitted gratis.

MEETINGS FOR THE ENSUING WEEK.

MON. ...Medical, 8½. Dr. E. Symes Thompson, "Indigestion in early Phthisis."

WED. ...Society of Arts, 8. Mr. B. H. Paul, "On Artificial Light and Materials used in Lighting."
Microscopical, 8.
Chemical, 8. Annual Meeting.

THUR. ...Society of Arts, 8. Cantor Lectures. Dr. F. Crace Calvert F.R.S., "Chemistry applied to the Arts—Use of Bones,&c.'
Artists and Amateurs, 8.

FRI.......Philological, 8.
Archæological Inst., 4.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

19. Railway and Canal, &c., Bills (43. Bromley Railway; Buckfastleigh, Totnes, and South Devon Railways; 82. Hammersmith and Wimbledon Railway; 83. Hayling Railways; Helston and Penryn Railway; 84. Henley in Arden Railway; 85. Hereford, Hay, and Brecon Railway; 86. Holywell Railway; 87. Isle of Purbeck Railway; 88. Kent Coast Railway; 89. Kew, Turnham Green, and Hammersmith Railway; 90. Kingston, Tooting, and London Railway; Kington and Eardisley Railway; Knightsbridge Railway; 91. Knutsford and Warrington Railway; 92. Lancashire and Yorkshire Railway (Additional Powers), (Blackburn, &c., Lines); 93. Lancashire Union Railway; 94. Leeds, Bradford, and Halifax Junction Railway (Nos. 1 and 2); 95. Liverpool Central Station Railway; 96. Llanelly Railway and Dock (No. 1) (Capital), (No. 2) (New Line); 97. Llanidloes and Newtown Railway; 98. London and South Western Railway (Chertsey Extension); 99. London and South Western Railway (Kensington, &c.); 100. London and South Western Railway (North Devon Extension); 101. London, Brighton, and South Coast Railway (Kemp Town Stations and Lines), (Ouse Valley Line), (Tunbridge Wells and Eastbourne Line); 102. Macclesfield and Knutsfield Railway; Macclesfield, Bollington, and Marple Railway; 103. Maidstone and Ashford Railway; 104. Manchester, Sheffield, and Lincolnshire Railway; 105. Market Harborough and East Norton Railway; Market Harborough and Melton Mowbray Railway; Marple, New Mills, and Hayfield Junction Railway; 106. Midland Railway (Bath and Thornbury), (Chesterfield to Sheffield), (New Lines, &c.); 107. Mistley, Thorpe, and Walton Railway; Monkland Railways; 110. Newcastle under Lyme Canal and North Staffordshire Railway; Newquay and Cornwall Junction Railway; 111. Newry and Greenore Railway; 112. North and South Junction Railway; 113. North and South Western Junction Railway; 114. North British Railway (Abbey Holme and Leegate Branch), (Carlisle Citadel Station Branch), (Perth Branch); 115. North Durham Railway; 116. North Eastern, Lancashire and Yorkshire, and West Yorkshire Railway; 117. North Staffordshire Railway (New Works), (Silverdale, Madeley, and Drayton); 118. North Western Railway; Okehampton Railway; 119. Oswestry and Newtown and other Railways (Amalgamation, &c.); 120. Oswestry and Newtown, London and North Western, and other Railways)—Board of Trade Reports.
79. East India (Education)—Copy of Despatch.
20. Bill—Insolvent Debtors.

Delivered on 2nd March, 1864.

34. Naval Receipt and Expenditure—Account.
39. Mortgaged Benefices—Return.
86. Metropolitan Improvements (Advances out of the Consolidated Fund)—Statements.
19. Railway and Canal, &c. Bills (163. Wood Green and Enfield Railway; 164. Worcester, Dean Forest, and Monmouth Railway; 165. Wrexham, Mold, and Connah's Quay Railway; 166. Bangor and Llanberis Direct Railway; 167. Bodmin, Wadebridge, and Cornwall Junction Railway; 168. Cowes and Newport Railway; 169. Crieff and Methven Junction and Branch Railway; 170. Erith Tramways; 171. Flintshire Railway; 172. Grand Western Canal and Bristol and Exeter Railway; 173. Halifax and Ovenden Junction Railway)—Board of Trade Reports.
38. Bill—Bills of Exchange and Promissory Notes (Ireland).

Patents.

From Commissioners of Patents Journal, March 18th.

GRANTS OF PROVISIONAL PROTECTION.

Artificial marble, manufacture of—485—H. A. Bonneville.
Artificial stone—490—F. Ransome.
Atmospheric engine—513—L. E. Mouline.
Balloons, &c.—591—R. A. Brooman.
Bricks, &c., preparation of clay for—579—A. V. Newton.
Buffers—512—J. Woodward.
Capillary filter, endless spouting—472—J. F. Rivier.
Casks, &c.—551—S. Bourne.
Centrifugal machines—528—F. P. Langenard.
Coal, &c., production of oil, &c., from—521—J. P. Raeburn.
Cotton, &c., machinery for opening, &c.—520—W. Noton.
Cradles, &c., inodorous apparatus applicable to—500—W. E. Gedge.
Cutters for facing up wood—533—E. H. Bentall.
Drilling machines—471—J. Buckton.
Dumb jockeys for breaking horses—599—S. Blackwell.
Dyeing—505—S. Cooper and J. M. Worrall.
Dyeing, &c., green colouring matters for—474—H. Carter.
Dyeing looped cut pile fabrics—583—J. M. Worrall.
Fabrics, braided or plaited—489—G. B. Braid and R. Furnival.
Fibrous materials, apparatus for ginning, &c.—587—C. Brakell.
Fibrous materials, preparing, &c.—478—E. Calvert and T. Edmeston.
Fibrous matters, dressing of—518—L. A. Laniel.
Files, manufacture of—565—C. Jordan.
Filtering apparatus—482—A. Prince.
Fire-arms, breech loading—492—E. C. Shepard.
Fire-arms, breech-loading—522—G. Davies.
Flour, apparatus for manufacturing—501—W. E. Gedge.
Fuel, compressed—479—J. Grantham.
Gloves—539—S. Pritchett.
Grain, machinery for drying, &c.—545—E. T. Hughes.
Green colouring matter—549—R. A. Brooman.
Hay-making machines—555—T. Grace.
Hides and skins, stretching and dressing—593—W. Clark.
Hoop skirts—475—W. E. Newton.
Iron, &c., forging, rolling, &c.—105—T. W. Plum.
Iron for ironing—484—E. Rolfe.
Linen, &c., mucilaginous matters for dressing—581—L. A. Laniel.
Locomotive and portable engines—439—E. E. Allen.
Locomotive engines—559—W. G. Beattie.
Locomotive engines, &c.—321—H. A. Fletcher.
Looped fabrics—483—J. Thornton and J. Higton.
Malt liquors, fermentation of—507—W. H. Mellor.
Manure from woollen rags, &c.—597—J. T. Way.
Memorandum book—499—C. Hibberd.
Metal sheathing, yellow—491—P. H. Muntz.
Money tills—527—G. Gaze.
Motive power, apparatus for obtaining—535—H. Bennison.
Ovens, construction of—553—F. Smith.
Percussion pouch—524—A. V. Newton.
Ploughs—477—J. H. Johnson.
Pontoons for building structures in water—575—J. Symes.
Railroad bars, &c., machinery for rolling—510—J. Robinson.
Railway breaks—457—A. and F. Izerable.
Railway carriages, &c., ascertaining the weight in—517—W. Bunger.
Shaking, riddling, &c., mechanism for—486—T. Bradford.
Silk waste, machinery for dressing—589—T. Greenwood and H. Hadley.
Slag, treatment of—476—G. Parry.
Spectral images, &c., on a stage—498—J. H. Pepper.
Steam boilers—509—T. Rickett.
Steam boilers, heating the feed water of—567—A. V. Newton.
Steam engines, rotary—502—W. Southam.
Steam generator—494—H. Barwell.
Textile materials, &c., roving, spinning, &c.—508—W. Cox.
Tin, &c., obtaining impressions on—571—W. E. Gedge.
Travelling bags, &c.—493—E. Bingham.
Tubes, rods, &c., manufacture of—541—G. P. Harding.
Twin screw propellers—514—E. Humphrys.
Velvets, &c., colouring the cotton or back of—496—J. P. Worrall.
Velvets, &c., manufacture of—511—W. E. Newton.
Velvets, &c., treatment of, previous to dyeing black—495—J. M. Worrall and S. Cooper.
Walking stick handles, &c., bending wood for—561—W. Dangerfield.
Walls, &c., sea and river embankment—527—B. P. Stockman and J. S. Scott.
Waste steam, heating water by means of—585—D. Brodie.
Water pressure engines—573—W. Clark.
Weaver's harness—515—E. T. Hughes.
Weights, break apparatus for raising, &c.—547—W. E. Newton.
Windlasses, &c.—557—L. Hill.
Wool, machinery for cleaning—523—E. F. Pastor, jun.

PATENTS SEALED.

2322. A. A. Downes.	2409. P. Leslie.
2323. G. Alcan.	2433. J. W. Guilmette.
2337. J. Bond and J. Bond.	2655. P. B. O'Neill.
2338. R. A. Brooman.	2676. O. C. Evans.
2345. W. Gibb and J. Holland.	2677. J. R. Johnson.
2346. W. T. Eley.	2699. S. H. Parkes.
2347. A. Collingridge.	3034. T. Harrison.
2351. W. Woofe.	3060. S. Smith.
2354. W. G. Helsby.	3093. T. Harrison.

From Commissioners of Patents Journal, March 22nd.

PATENTS SEALED.

2350. A. E. Ragon.	2490. J. W. Goundry.
2357. J. Sturgeon.	2520. W. J. Rideout.
2370. W. Clark.	2573. J. W. Nottingham.
2374. W. Malam and W. Tice.	2581. C. Schiele.
2377. L. J. J. Jean.	2731. J. A. Barral and L. A. Cochery.
2378. P. Bourchani.	2747. R. T. Tait.
2379. P. Cato.	3. J. W. Nottingham, W. H. Postlethwaite, & A. H. A. Durant.
2382. J. H. Johnson.	159. H. Brockhurst and J. Sullivan.
2392. P. and J. Llewellin and J. W. James.	204. H. A. Bonneville.
2410. T. Horsley.	
2455. C. P. Button.	
2458. E. Slaughter.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

642. J. A. Phillips.	687. B. West.
652. F. Trachsel and T. Clayton.	693. T. Brooks.
705. M. J. F. Chappellier.	701. N. Lloyd and J. G. Dale.
670. W. F. Henson.	710. W. Andrews.
664. J. Holden.	795. R. Ridley and J. Rothery.
678. C. N. Kottula.	843. W. E. Newton.
891. J. Lancelott.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

763. J., T., and G. Wilkes.	776. T. S. Adshead and J. Holden.
744. C. & J. Askew & H. Myers.	807. H. and E. T. Dolby.
791. W. Moxon, J. Clayton, and S. Fearnley.	

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, APRIL 1, 1864. [No. 593. Vol. XII.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at 8 o'clock.

April 6.—"On the Principle of Imitation as Applied to the Decorative Arts." By Thomas Purdie, Esq.

April 13.—"On a New Process of Preserving Meat." By Dr. Morgan, Professor in the Royal College of Surgeons, Ireland.

Cantor Lectures.

The next lecture on "Chemistry applied to the Arts" will be delivered by Dr. F. Crace Calvert, F.R.S., F.C.S., corresponding member of the Royal Academy of Turin, of the Société Industrielle de Mulhouse, of the Société Imperiale de Pharmacie de Paris, &c., on Thursday evening, at 8 o'clock, as follows:—

April 7.—Lecture II.—Gelatine, Glue, Bone-size Chondrine, their preparation, chemical properties, nutritive value, and application to arts and manufactures. Artificial tortoiseshell. *Isinglass*, its adulterations and adaptations to clarification of fluids. *Skins* and the art of tanning.

April 14.—Lecture III.—Leather.—The art of the currier. Morocco, Russia, and patent leathers. The art of tawing skins. Chamois and glove skins. Parchment. *Hair*, its composition and dyeing. *Wool*, its washing, scouring, bleaching, and dyeing. *Silk*, its adulterations and conditioning.

April 21.—Lecture IV.—Animal Fatty Matters, the various processes for liberating them from the tissues in which they are contained. Their composition and conversion into soap. Composite candles. The refining of lard. *Cod-liver*, *sperm*, and other oils. *Spermaceti* and *wax*.

April 28.—Lecture V.—Flesh, its chief constituents, boiling, roasting, and preservation. *Animal black*, its manufacture and applications. The employment of animal refuse in the manufacture of *prussiate of potash*. *Prussian blue*. Manufacture of artificial animal manures.

May 5.—Lecture VI.—Animal Liquids.—*Bile*, its purification and detergent properties. *Blood*, its application in the refining of sugar and the manufacture of albumen. *Albumen*, its use in calico printing and photography. *Urine*, its uses. *Milk*, its composition properties, falsification, and preservation. A few words on putrefaction.

Proceedings of the Society.

Fifteenth Ordinary Meeting.

Wednesday, March 30th, 1864; Thomas Sopwith, Esq., F.R.S., Member of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Dircks, Henry, 16, Bucklersbury, E.C.
Gladstone, Thomas Murray, Lloyd's Proving Works, E.C.
Hodson, Francis, 6, Furnival's-inn, Holborn, E.C.
Keeling, E. Bassett, 4, Verulam-buildings, W.C.
Peterson, Charles, Newport, Isle of Wight.
Slade, Jeremiah, 102 and 103, St. John-street-road, E.C.
Turner, George, Northfleet, Kent.

And as Honorary Corresponding Member,
Fowler, John Townshend, Madras.

The following candidates were balloted for and duly elected members of the Society:—

Barber, Thomas Archer, 2, Scott's-place, Lower-road, Islington.
Cheesewright, Charles, Alma-terrace, Highbury, N.
Hales, Edward, Dover.
Salt, Thomas Partridge, Ashton-villa, Moseley, Birmingham.
Slee, Edward, Church-street, Horselydown, S.E., and Clapham-park, S.

The Secretary called attention to new forms of barometer and thermometer, manufactured by Mr. Hicks, of Hatton-garden. Descriptions of these instruments are given at page 323.

The Paper read was—

ARTIFICIAL LIGHT AND LIGHTING MATERIALS.

By B. H. Paul, Esq.

The use of artificial light being one of those appliances which belong to an advanced state of civilisation, it has naturally undergone that kind of progressive development which is characteristic of such arts. There has been, within the last 100 years, not only an immense improvement in the methods of obtaining artificial light, but also an equally important change in the sources whence lighting materials have been derived.

Towards the end of last century the only materials used for lighting were animal fats, such as tallow and fish oils, the former being used as candles, the latter burnt in lamps. Improvements were, from time to time, made in the preparation of these materials, by the introduction of new substances, and also in methods of using them; but those improvements, though highly advantageous, sink into insignificance when compared with the introduction of coal gas as a lighting material. In towns, the use of gas soon prevailed over the use of other lighting materials, but in the country, and especially in remote places, candles and lamps still continue to be largely used. The advantages of gas are indeed of such a nature as to require a thickly-populated town or district in order to be fully realised.

One of the materials formerly used for lighting, to a small extent and in a few localities, was petroleum; and some years before the introduction of gas, attempts were

made to prepare artificial petroleum from various bituminous minerals, in order to use it as a source of light. These attempts were progressing fairly, when the discovery that the inflammable gas obtainable from coal by heat, could be used for lighting purposes, was made known by Murdoch, and this new method of lighting became, for a time, almost the sole object of attention in regard to artificial light. The manufacture of artificial petroleum was, however, continued to some extent, in a few places, where circumstances were unfavourable for the introduction of gas lighting. About the year 1830 works were established in France for this purpose, and have continued in operation to this day. Somewhat later, other works were started in other parts of the continent as well as in this country; about the year 1853, the earth oil of Rangoon was examined by Mr. Warren De La Rue and Hugo Müller, with a view to its application for lighting purposes, and about the year 1860, the extraordinarily abundant supplies of petroleum in America became the object of special interest as materials for lighting.

Chemical Nature of Hydro-carbon Oils used for Lighting.

It is mainly to the products of natural and artificial materials, known under the various names of photogen, paraffin oil, &c., that I now beg to request your attention. Whether these materials be of natural or artificial origin, they all appear to agree in possessing the same general character, and in being of the same chemical nature. The chemical history of these materials is still very incomplete; but according to the results of the best chemical investigations, they appear to consist, for the most part, of mixtures of a considerable number of hydro-carbons, which differ from each other by small degrees in physical character and chemical composition, but at the same time present a general analogy among each other, and with the gaseous hydro-carbon known as marsh gas. This substance constitutes the initial and typical member of the series, while, at the other extremity of the series, are solid hydro-carbons, resembling wax or spermaceti in appearance, constituting a number of substances known to chemists under the collective name of paraffin. Between these two extremes there are a great number of other substances, solid, liquid, and gaseous, some of which have been separated and examined; others have not yet been obtained in an isolated state.

In addition to the hydro-carbons above enumerated, some others, belonging to other chemical series, have been detected, in smaller and varying proportions, both in the various kinds of natural petroleum, and in the tarry oils obtained by distilling bituminous minerals, peat, wood, &c., at a temperature not exceeding dull redness. These latter also contain a considerable proportion of oxygenated oils, which partake in general of the nature of creasote. In the natural petroleum the amount of these oxygenated oils is very much smaller, and it is only in some few instances that their presence has been recognised with any degree of certainty. Both in the natural petroleum and in the oils obtained by destructive distillation, there is always more or less of a kind of pitchy substance in solution, which gives to these liquids their characteristic black and tarry appearance, and there are likewise small quantities of strong-smelling substances, to which the peculiar and generally offensive smell of these materials is due.

Origin of Natural Hydro-carbon Materials.

The very intimate chemical relation between native petroleum and the oily products of dry distillation, is highly interesting from the probability which it appears to suggest, that these materials, whether natural or artificial, have a common, or at least, a closely analogous origin. The close resemblance between petroleum and the oily products of dry distillation has long been recognised, and the actual identity of a great many of their several constituents which has been only recently ascertained, is but a more detailed elucidation of the obvious analogy between these materials. Guided by this analogy, many naturalists have come to the conclusion that petroleum, in the various states in which it is met with, is the product of a kind of natural distillation that has taken place, or may be still going on, in the interior of the earth.

Whether or not this speculation be strictly correct, it undoubtedly presents a high degree of probability. All organic substances which are not themselves volatile, such as wood, flesh, and other vegetable and animal substances, yield, when subjected to the influence of heat below dull redness, tarry oils, which have in all cases the same general character and similarity to petroleum; differing only according to the specific differences in the materials from which they may have been obtained.

The various kinds of bituminous minerals met with chiefly in the coal measures, and to some extent in other geological situations, also yield, under similar conditions, oily products of the same general character. This fact at once becomes intelligible when it is remembered that the bituminous portion of the minerals from which such products are obtainable, has originated from the same kind of vegetable and animal substances that are now met with in nature. Hence, whether it be supposed that natural petroleum has been produced by an actual distillation of bituminous minerals, or by some other process, different, and slower in its operation, though effecting the same result as distillation, it is not the less evident that the ultimate sources of the minerals which serve for the manufacture of those lighting materials to which I am now referring, are in all cases the same—namely, organic substances, and those, in all probability, for the most part of vegetable origin.

There is, however, an important difference between these bituminous minerals and unaltered organic substances, in regard to their fitness for yielding by distillation such products as are suitable for the manufacture of hydro-carbon lighting materials. This is the difference that exists between the composition of unaltered organic substances and the composition of those remains of organic substances belonging to former epochs, which constitute the bituminous portion of the minerals to whose formation they have partly contributed.

Taking, for the sake of illustration, dry wood as representing the composition of the organic substances, which are the primary sources of bituminous minerals, and comparing it with the average composition of the bituminous portion of coal, it appears that for a given percentage of hydrogen the relative amounts of carbon and oxygen are widely different.

	Wood.	Coal.
Carbon	50·00	88·15
Hydrogen	5·55	5·26
Oxygen	44·45	6·59
	100·00	100·00

This difference arises from the alteration the organic substances have undergone during their passage into that bituminous portion of minerals by which they are now represented. This alteration consists in a progressive elimination of the oxygen, either as water or carbonic acid or both, and the consequent concentration of carbon, as may be seen from the following representation of this change:—

	Composition of wood.		Composition of water.		Residue.		Composition of carbonic acid.		Residue.
Carbon ...	50·00				50·00	–	6	=	44·00
Hydrogen	5·55	–	1	=	4·55				4·55
Oxygen...	44·45	–	8	=	36·45	–	16	=	20·45
	100·00	–	9	=	91·00	–	22	=	69·00

This change is analogous to that which takes place in decaying organic substances, and is, in fact, a slow carbonization. Its effect is of considerable importance as regards the artificial production of hydro-carbons for lighting pur-

poses, inasmuch as the value of any material for this purpose increases with the increase in the amount of hydrogen, and the decrease in the amount of oxygen they contain. It is on account of the large amount of oxygen in wood and peat, as compared with coal, that those materials are less suitable for the manufacture either of illuminating gas or hydro-carbon oils. In the former case the gas produced from them contains such a large amount of carbonic acid, that its illuminating power is very slight, and in the latter case, the oils produced by distillation, are contaminated with oxygenated oils and resinous substances, which render their purification more troublesome than that of the oils obtainable from bituminous minerals, in which the amount of oxygen remaining is so much less.

But there is another feature in this alteration of the organic substances from which the bituminous portion of the minerals in question has originated. By referring to the above comparison between the composition of wood and that of coal, it will be seen that not only has the oxygen been, to a great extent, eliminated, but there has been an alteration in the ratio existing between the hydrogen and carbon. Instead of being, as in the case of wood, in the ratio of 1 hydrogen to 9 carbon, it is in coal in the ratio of 1 hydrogen to 17 carbon. This circumstance is indicative of the separation, during the change that has taken place in the conversion of decaying organic remains into the constituent bituminous minerals, of a compound of carbon and hydrogen, such, for instance, as marsh gas.

This gas, consisting of carbon and hydrogen in the ratio of 3 to 1, is always produced in putrefaction, and by the action of heat upon organic substances. It also occurs naturally in connection with the coal measures, constituting, together with small quantities of olefiant gas and nitrogen, the main portion of the fire damp of coal mines. Carbonic acid gas is also of frequent occurrence in coal mines. These facts, together with the close chemical relationship between marsh gas and the various constituents of petroleum, all agree in adding to the probability of a very close connection between bituminous minerals and the various kinds of petroleum; a connection of such a nature, in all probability, that they should be regarded as of simultaneous origin, in the same way that the carburetted hydrogen or marsh gas of coal mines, has most likely originated, not from the decomposition of coal itself, but conjointly with coal, by the progressive alteration of the organic remains whence it and other bituminous minerals have been formed.

Exhalations of marsh gas almost always accompany the discharge of petroleum from natural springs, and in most of the American petroleum it is possible to recognise the presence of small portions of the other substances, ranging next to marsh gas in the above series, and gaseous under ordinary conditions of temperature and pressure.

Characters of Hydro-carbon Lamp Oils.

In the absence of any important difference between those constituents of natural petroleum and of the oils obtained by distilling bituminous minerals, which are capable of being employed as lighting materials, it will be unnecessary to draw any special distinction between the oils manufactured for that purpose from different materials; and, in considering the characters which are requisite in these products, they need be contrasted only in regard to certain minor details, that are more consequences of the methods of manufacture practised, than of any more essential difference.

By examining the tabular statement of the composition and characters of the various substances constituting both petroleum and the so-called coal or shale oils, and considering what are the conditions under which the oils prepared from these materials are to be used for lighting

	Carbon.	Hydrogen.	Sp. Gr.	Carbon in one gallon.	Boiling point Fahr.	Vapour density.	Carbon in equal volumes of vapour.	Volume of air requisite for burning equal volumes of vapour.
				lbs.				
1 Methyl-hydride $C_2\ H_4$ (marsh gas).	75·00	25·00	—	—	gas	0·554	—	10
2 Ethyl-hydride $C_4\ H_6$	80·00	20·00	—	—	,,	1·04	—	—
3 Propyl-hydride $C_6\ H_8$	81·81	18·19	—	—	,,	1·52	—	—
4 Butyl-hydride $C_8\ H_{10}$	82·76	17·24	—	—	,,	2·01	—	—
5 Amyl-hydride $C_{10}\ H_{12}$	83·33	16·67	0·628	5·233	86	2·49	2·5	—
6 Hexyl-hydride $C_{12}\ H_{14}$	83·72	16·28	0·669	—	158	2·97	3·0	—
7 Heptyl-hydride $C_{14}\ H_{16}$	84·00	16·00	0·699	5·9	198	3·46	3·5	70
8 Octyl-hydride $C_{16}\ H_{18}$	84·21	15·79	0·726	—	243	3·94	4·0	—
9 Nonyl-hydride $C_{18}\ H_{20}$	—	—	0·747	—	278	—	4·5	—
10 ,, $C_{20}\ H_{22}$	84·50	15·50	0·757	—	321	—	5·0	—
11 ,, $C_{22}\ H_{24}$	84·61	15·39	0·766	—	359	—	5·5	—
12 ,, $C_{24}\ H_{26}$	—	—	0·776	—	408	—	6·0	—
13 ,, $C_{26}\ H_{28}$	84·78	15·22	0·792	—	423	—	6·5	—
14 ,, $C_{28}\ H_{30}$	84·84	15·16	0·800	6·787	460	6·85	7·0	—
15 ,, $C_{30}\ H_{32}$	—	—	—	—	496	—	7·5	—
16 Cetyl-hydride $C_{32}\ H_{34}$	—	—	—	—	527	7·825	8·0	—
17 ,, $C_{34}\ H_{36}$	85·00	15·00	0·825	7·022	...	8·37	8·5	—
18 ,, $C_{36}\ H_{38}$	—	—	—	—	...	—	9·0	—
19 ,, $C_{38}\ H_{40}$	—	—	—	—	...	—	9·5	—
20 ,, $C_{40}\ H_{42}$	85·10	14·90	—	—	...	—	10·0	—
21 ,, $C_{42}\ H_{44}$	—	—	—	—	...	—	10·5	—
					Melting point.			
25 Candle paraffin? $C_{50}\ H_{52}$	85·23	14·77	0·870	7·41	130	12·19	12·5	—
27 Ceryl-hydride $C_{54}\ H_{56}$	—	—	—	—	136	—	13·5	—
30 Myricyl-hydride $C_{60}\ H_{62}$	85·31	14·69	0·890	—	143	14·61	15·0	—
Olefiant gas $C_4\ H_4$	85·71	14·29	—	—	gas.	0·97	1·0	15

purposes, it will be evident that there is only a portion either of the natural or artificial material that is applicable as oil for burning in lamps.

Leaving out of consideration the first four members of the series, which are gaseous at ordinary temperatures, it will be seen that the remaining members of the series, which are liquid at ordinary temperatures, gradually increase in specific gravity, varying in this respect to the extent of $6\frac{1}{4}$ pounds per gallon to about $8\frac{3}{4}$ pounds per gallon. Beyond this latter point the other members of the series are solids, and come under the general denomination of paraffin.

Another important point of difference consists in the boiling point of the individual members of the series. This varies from 87° F. to upwards of 600° F. It is to this character that attention requires to be chiefly directed in regard to the degree of safety with which these substances can be used for burning in lamps. I say the *degree* of safety, because I am far from being disposed to agree with the opinion that has been put forward that the use of any of these substances is necessarily attended with danger. On the contrary, I am strongly inclined to think that all or any of them may be used without any necessary risk being incurred. Of course, due precautions must be observed in the use of these substances, and those precautions must be greater than are requisite in the case of the oils that were formerly used as lighting materials, viz., the fat oils obtained from animals, fish, and plants. Hydro-carbon oils are, by their nature, much more combustible than fat oils, at the same time that they possess higher illuminating power, and it would be by no means prudent to deal with the one in the same manner as with the other.

The outcry that has been raised against the dangerous character of hydro-carbon oils is, however, in no degree more deserving of respect than that which was raised on the same visionary ground when the use of gas was first introduced. All that is really necessary to avoid accident with the hydro-carbon oils is, that those who use them should be properly instructed as to the way in which they should be stored and used. By this means it will be far more likely that the desired result of preventing accident may be secured, than by exciting a vague and unreasonable apprehension of danger.

In regard to the safety of hydro-carbon oil used for burning in lamps, the main consideration is its capability of giving off vapour spontaneously at the ordinary temperature, or when the oil becomes slightly warmed. In regard to this character the various liquid members of the substances given in the table differ considerably. Taking the first of those that are liquid at the ordinary temperature, it will be seen that its boiling point, which is the thermometric indication of its degree of volatility, is 86° Fahr., a temperature so little above that which may exist in a room where lamps are used, that it would be very objectionable to use such a liquid as a lighting material in that way. The temperatures given in the table as the boiling points of the individual oils are not by any means the lowest temperatures at which they evolve vapour, and for this reason, if we fix 80° or 90° Fahr. as the highest temperature to which the oil in a lamp is capable of being raised, even in an extreme case, the boiling point of a liquid that would be suitable for burning in lamps, under such conditions, ought not to be less than 200° Fahr. above that temperature.

With the lamps now generally in use for burning hydro-carbon oils, it would be only under very exceptional and improbable circumstances that the oil in the lamp could become heated to a temperature so so high as 80 deg. Fahr., and even then some of the more volatile portions of these oils, boiling at about 160 deg. Fahr., might be burnt without any danger.

But the hydro-carbon lamp oils are never distinct substances in a chemical sense, like the several substances whose characters are described in the above table. They are always mere mixtures of a number of those substances, and consequently they do not present any constant point of ebullition, while the specific gravity and other characters are the mean of those appertaining to the several substances present in the mixture, and that mean also varies according to the relative proportions of the mixed substances.

The absolute separation of these substances is, indeed, a matter almost of impossibility, and, so far as relates to their practical application, not by any means requisite. It is, however, essential that in preparing hydro-carbon oil for use in lamps, the manufacture should be conducted in such a manner as to secure the separation of the more volatile portions, to such an extent, that the oil, when finished, may be heated to 100° Fahr. without taking fire when the flame of a match is brought into contact with its surface, in an open vessel such as a saucer. Oil that will bear this test is, I believe, perfectly safe for all reasonable use; and I am of opinion that this simple test is by far the best criterion of the proper character of such oils. While, of the oils constituting petroleum and coal oil, those which have a boiling point below 280° Fahr. would be too volatile for ordinary use in lamps, on the other hand, those which have a boiling point above 600 deg. Fahr. are also unfit for this purpose, but for very different reasons. It has commonly been supposed that the reason why these latter oils do not burn well in the ordinary lamps is, that they are too thick, and have not sufficient capillarity to rise in the wick and feed the flame. I am disposed to think that this view is erroneous, and am more inclined to the opinion that their defects, as lamp-oils, are to be ascribed rather to the high temperature requisite for their volatilization, and also to the greater density of their vapour. The chief difficulty that is experienced in the use of these oils of high boiling point, which are generally known as heavy oils, is the charring of the lamp wicks, and the small flame they give.

By reference to the table it will be seen that the oil which has a boiling point of 527° F., affords a vapour that is twice as dense as that of the oil boiling at 243° F., or, in other words, a given weight of the former oil occupies in the state of vapour only half the bulk of an equal weight of the latter also in a state of vapour. This circumstance alone will, to a great extent, account for the smaller flame of the heavier oils as compared with that of the more volatile oils, whose vapours are less dense. Then, in proportion as the volatility of the oils decreases, or as the temperature requisite for their volatilization increases, at the same time a greater degree of heat is necessary to effect that decomposition of the vapour into gas, which is an essential step in their combustion for lighting purposes. The temperature necessary to effect these changes is so high, that at the same time the wick itself gradually becomes charred and incapable of exercising that capillary action by which the flame can be fed with oil. In addition to these circumstances, it must also be remembered that in proportion as the density of the oil vapour increases, so does the amount of carbon in the vapour increase, and, at the same time, there is a proportionate increase, both in the heating power and the illuminating power of equal volumes of the vapour. Consequently, in using heavy oil of high boiling point in a lamp, the result is that a very small, intensely hot and highly luminous flame is produced at first, and after a very short time the wick becomes charred and incrusted with the surplus carbon, separated in the flame, to such an extent that it soon begins to decrease in size and to lose brilliancy.

It appears, therefore, that the oils at either extremity of the series are equally unfit for use in the ordinary hydro-carbon oil lamps. But in practice it never happens that any one of the several substances described in the table is used for lighting purposes. It is always a mixture of a number of them that is used. Still, the facts that I have just pointed out in regard to the extreme cases, exercise their influence in the same manner with regard to this mixture. On the one hand, it must not contain any such amount of the more volatile members of the

series, as will confer upon the mixture the property of giving off inflammable vapour when heated to 100° F., or enable it to become permanently inflamed when brought in contact with a lighted match while at that temperature. On the other hand this mixture must not contain such a proportion of the heavier and less volatile oils, as would render the vapour forming the flame too dense and too highly carbonaceous, and necessitate too high a temperature for that decomposition of the vapour which is essential to the production of light.

The due proportion of these various conditions is secured in practice by collecting the oils during distillation in fractional portions: that which distils over first containing the oils that are too volatile for use in lamps; the second portion that distils over being the burning oil, and the third portion containing the heavy oils and paraffin.

The precise points at which this separation of the oil into these three portions, takes place, will depend very much upon the nature of the material operated upon. In this respect there are great differences in the various materials now used as sources of these lighting oils. American petroleum generally requires the separation of some 20 or 25 per cent. of its bulk, which is too volatile for use in lamps. Canadian petroleum does not require more than 10 per cent. to be separated on this account. Coal and shale oils also vary much in this respect, according to the material they are produced from, and the temperature at which the crude oil is distilled from the coal or shale. As a general rule, the crude oil of coal or shale contains a greater amount of the volatile oils, the lower the temperature those materials are distilled at. This, however, is not a disadvantage, since the amount of crude oil obtainable is greater, the lower the temperature of the distillation. Generally speaking, coal or shale oil does not require that more than 5 to 15 per cent. of the bulk should be separated as too volatile to be mixed with the burning oil.

At the other extreme there are also differences between petroleum and coal or shale oils. The burning oils manufactured from the latter sources, as generally met with, have a specific gravity of about 0·825, while the specific gravity of those made from petroleum is rarely above 0·800, and sometimes as low as 0·780.

I do not believe there is any really sufficient reason why there should be this difference in the case of petroleum, which, as I shall afterwards point out, involves a serious disadvantage as regards its illuminating power compared with that of coal oil. The manufacture of these commodities, however, is still carried on so much more by mere rule of thumb, than under the guidance of sound principles based upon knowledge of the materials dealt with, that defects of this kind cannot be wondered at, and it will probably be some long time before these processes come to be carried on in such a way as to secure the best results both to the producer and the consumer.

Illuminating Power.

In the case of all kinds of lighting materials, the light produced when they are burnt, is due to their containing, or yielding when heated, olefiant gas, or other hydrocarbon gases, which are equivalent to it as regards the production of light. In the production of artificial light by any of the means that have been hitherto commonly used, it is always the result of the intense ignition of solid particles of carbon. Luminiferous hydro-carbon gases and vapours, which, for convenience sake, may be collectively represented by the term olefiant gas, all agree in the character of being decomposed at a temperature higher than that requisite for their production, in such a manner that the greater part of the carbon they contain, is set free in a state of very minute division. This is an essential character of these luminiferous substances. In any ordinary luminous flame the particles of carbon so separated become intensely heated, and emit light while being burnt, giving to the flame its whiteness and brilliancy.

The production of heat is, therefore, an essential preliminary to the production of light, and it is also equally necessary for the production of light that the heat produced should act upon some solid substance. The separation of minutely-divided carbon from the luminiferous hydrocarbons, when they are heated, provides this essential condition for the production of light. Gases or vapours which do not yield any solid substance when burnt, do not afford a luminous flame, or at most, only a feeble light. Thus, for instance, hydrogen and marsh gas, or sulphur, burn without evolving any considerable light. Olefiant gas, on the contrary, burns with an intensely white luminous flame. At the same time it is indispensable that the solid particles separated in an ordinary flame should not retain their solid state, but should, by combustion, be converted into gas. The carbon separated in the flame of ordinary lighting materials, burns and is converted into carbonic acid gas. If this were not the case every flame would constantly produce a shower of dust.

The greater the number of solid heated particles in a flame, the greater will be the light it evolves, consequently, the amount of light capable of being produced by various hydro-carbon gases and vapours, or their illuminating power, is directly proportionate to the amount of carbon contained in a given volume of the gas or vapour, and capable of being separated during combustion. Taking olefiant gas as the standard of comparison, and referring to the table of the several hydro-carbon oils constituting petroleum and coal oil, it will be seen that the individual members of the series differ very considerably in this particular, and the figures expressing the relative amount of carbon also express the relative illuminating power of equal volumes of their vapours.

It is probable that in burning the vapour of any one of these substances the general nature of the decomposition which takes place consists in the production of marsh gas which burns, and the separation of all the carbon over and above that requisite for the formation of marsh gas. Consequently, in the flame of the substance, No. 4 of the table, there would be nearly twice as much carbon separated as in the flame of olefiant gas. Separation of carbon to such an extent would be more than sufficient for the production of light under ordinary circumstances, and would be accompanied by a tendency to the production of smoke, in consequence of some of the carbon escaping combustion. This tendency would of course be greater in proportion to the increased amount of carbon in the vapour, and although the illuminating capability would be greater in the same proportion, it would not be possible to realise that capability except under special conditions.

There is, therefore, a practical limit, in regard to the mode in which lighting materials are generally used, beyond which an increase in the amount of carbon in the material would be rather prejudicial than otherwise.

In the case of gas, it is never anything like an approximation to pure olefiant gas that is used, but only a mixture of it with other gases, containing from 5 to upwards of 20 per cent. of olefiant gas. The following gives the composition of coal gas in various localities :—

	Manchester. Roscoe.	Greenock. T. Thomson.			Newcastle. T. Richardson.		Boghead. Fyfe.
Olefiant gas.........	8·84	14·50	17·50	20·00	10·19	9·25	27
Marsh gas	34·90	66·49	59·94	47·77	31·35	36·05	...
Hydrogen..............	45·58	12·29	11·46	17·32	28·80	30·17	...
Carbonic oxide ...	6·64	7·07	12·	11·76	16·28	11·42	...
Carbonic acid	3·67	...	...	...	...	...	...
Nitrogen	2·46	...	...	...	...	...	...
Sulph. hydrogen..	0·29	...	...	...	...	...	...

Of these gases, the first three after olefiant gas, are the only ones that take any part in the production of light, the others being mere impurities. Those gases, however, do not contribute directly to the production of light to any extent, but being themselves combustible, serve in part, to produce heat requisite for decomposing the olefiant

gas, and rendering the particles of carbon separated from it luminous. They also serve to prevent the flame from smoking, by diluting the olefiant gas, and thus admitting of its being brought more intimately in contact with the air required for perfect combustion. They also give bulk to the flame, and thus diminish the concentration of the light which would take place if the olefiant gas were burnt without any admixture.

In all these respects each one of the three gases answers the purpose required of it equally well or nearly so. There are, however, other particulars in regard to which there is a very considerable difference in their fitness for these purposes. This difference consists in the respective capability of these gases for producing heat and carbonic acid by their combustion. Any amount of heat produced by burning any lighting material, over and above that requisite for giving the necessary temperature to the flame, is obviously objectionable, since it would have the effect of heating the atmosphere of the space lighted and rendering it oppressive. Since all lighting materials contain carbon, and by their combustion abstract oxygen from the air, the production of carbonic acid is, to some extent, a necessary result of the use of any such material; but, on account of the prejudicial influence of this gas, it is highly desirable that the quantity produced, for a given quantity of light, should be as small as possible. In both these respects there is a very wide difference between the effects of the three gases which are generally contained in coal gas as the dilutants of the olefiant gas. This will be seen from the following table:—

	Heating power for equal volumes.	Relative volume of Oxygen consumed.	Volume of Carbonic acid produced.	Temperature of Flame.
		Air.		Fahr.
Hydrogen	4299	0·5 = 2·5	0	4966°
Carbonic oxide	3234	0·5 = 2·5	1	5619°
Marsh gas......	14,634	2·0 = 10·0	1	4940°
Olefiant gas ...	...	3 = 15	2	...

This comparison serves to show that although hydrogen produces more heat by combustion, and gives a lower temperature in the flame, than carbonic oxide, still it is the best substance to be used for diluting the olefiant gas, since it affords no carbonic acid. On the contrary, marsh gas is worse even than carbonic oxide, on account of its producing much more heat and carbonic acid. In regard to the amount of carbonic acid generated, and the heating effect produced for a given quantity of light, gas, however, has a great advantage over any of the lighting materials formerly used. As compared with tallow, for instance, gas produces only one half or less than half as much carbonic acid, and little more than one-third the heating effect. But it would be a very great improvement in the manufacture of gas if it could be produced with hydrogen alone as the diluting substance. Many years ago an attempt was made to effect this by Selligue in Paris, and subsequently the same thing was tried in this country by Professor Donovan and Mr. White, under the name of water gas; but both projects proved unsuccessful, owing to a variety of adverse circumstances.

It will be evident from what has already been said with regard to the dependance of the luminosity of a flame upon its temperature, that it is desirable to produce the highest attainable temperature in the flame, and that any means of increasing that temperature would have the effect of increasing the illuminating effect. A very elegant contrivance for this purpose, in the case of gas, has been devised by Dr. Frankland. It consists in heating the air consumed in the combustion of the gas, by means of the waste heat radiated from the flame, by making it pass down along the side of the chimney before entering at the bottom of the burner to supply the flame. In this way the air is heated to 500° or 600° F., and there is, of course, a corresponding increase of temperature in the flame. Dr. Frankland has ascertained that by this simple appliance the same amount of light may be obtained with a saving of 49 per cent. of gas, and that for a given consumption of gas there is an increase in the illuminating effect to the extent of 67 per cent.

Returning now to the liquid hydro-carbon oils used for lamps, I will endeavour to point out how the principles I have described in reference to gas, obtain in the application of those oils to lighting purposes. In this case the hydro carbon vapour is not mixed with any diluting substance, as in gas, and all of these oils would give off a considerable amount of smoke if burnt in the same way as fat oils, by reason of the highly carbonaceous nature of their vapours. This circumstance was one of the most serious impediments to the introduction of these oils in the first instance, but eventually a lamp was devised which satisfied all requirements, and which is now largely in use. To understand the way in which the combustion of hydro-carbon oils in these lamps is effected without production of smoke, it must be remembered that in ordinary cases the flame of any lighting material, being for the most part gaseous and in contact with atmospheric air, there is, in accordance with the well-known laws of gaseous diffusion, a continual intermixture of air with the gaseous substances in the flame, and the extent to which this intermixture takes place is determined by several conditions, which may be regulated at pleasure. To take the simplest case, that of gas; the rate of intermixture will be proportionate with the rate at which the gas issues from the burner, and to the velocity of the current of air passing along the sides of the flame. When gas is burnt with a large argand gas burner it is very liable to smoke, but when a glass cylinder is placed over the flame, the gas burns without smoke, in consequence of the greater intermixture of air with the flame, caused by the draught of the chimney. The degree of draught, and consequently of intermixture of air with the burning gas will depend upon the height of the chimney. With a very high chimney and powerful draught the intermixture may be effected to such an extent as to neutralize, almost entirely, the illuminating power of the flame. In order, therefore, to effect perfect combustion without loss of lighting effect, it is necessary to proportion these determining conditions of the intermixture of air with the flame, according to the nature of the material to be burnt.

It is in this manner that the combustion of the hydrocarbon oil in lamps is effected. By means of the chimney a strong current of air is produced, and by means of the perforated cone, immediately over the wick, that current of air is made to impinge upon the ascending vapour, and mix with it so as to enable it to burn without smoke. In this case, therefore, the air, by means of which combustion is supported, is made to serve the purpose of the diluting gases in ordinary coal gas, giving greater bulk to the gaseous contents of the flame, and effecting such a distribution of the ignited particles of carbon, as to admit of their being perfectly burnt.

The necessity of this admixture of air with the vapour of hydro-carbon oil to enable it to burn without smoke, is of course greater in proportion as that vapour is denser and more highly carbonaceous. In this respect it will be seen that the several members of the series of substances constituting these oils differ materially. For instance, the vapour density of No. 16 is twice as great as that of No. 4, and there is the same difference between the amounts of carbon in the vapours. The former vapour would also have double the illuminating power of the latter; but the size of the flame of No. 16 would be proportionately smaller, and owing to these two circumstances, the ignited particles of carbon would be so crowded together that a great deal of smoke would be produced unless a copious intermixture of air was effected by means of a very vigorous draught.

Practically the differences between the several substances here referred to, compensate each other in consequence of their being mixed together, in the various kinds of hydro-carbon oils. Thus the higher illuminating power of the denser vapours is to a great extent rendered available by the more bulky nature of the less carbonaceous vapours, and in this way a mean result is arrived at, of both characters combined, which answers all desired purposes. Everything depends upon the due proportionate mixture of the different substances.

From these considerations it will be seen that there is a positive disadvantage in carrying the separation of the more volatile portions of the oil beyond such a point as is indispensably requisite for its being used with safety; for the more those substances are separated from the oil intended to be used in lamps, so much the more must the least volatile portions, at the opposite extremity, be separated from it, in order to obtain a material fit to burn without smoke, and with a sufficiently large flame.

It will now be necessary to consider briefly the appplicability for lighting purposes of the hydro-carbon oils which are too volatile to be used in the ordinary lamps. It is a fact that will be familiar to many of the members of this Society, that the idea of applying such highly volatile hydro-carbons as lighting materials is not, by any means, a thing of yesterday. It was first conceived, I believe, long before the year 1830, by a gentleman who has occupied, and still occupies, a most prominent position among those who have contributed to the successful establishment of gas lighting. Mr. Lowe's original proposal was to use the volatile hydro-carbons obtained from the tar of gas works in the place of water in gas meters, so as to serve the double purpose of measuring the gas supplied to consumers, and of augmenting its illuminating power. Next to him came Professor Donovan, who proposed to make water-gas the medium for vaporizing these liquid hydro-carbons; and he appears to have formed this idea independently of any knowledge of Mr. Lowe's plan of naphthalizing gas. However that may be, the originality of the project in point of time certainly belongs to Mr. Lowe. These projects attracted very great attention at the time; but they never came into anything like general application. It may be that on reflection, the gas companies did not esteem very highly a plan for doubling the illuminating power of their gas, since that advantage was not necessarily accompanied by a demand for twice as much light as was previously used.

Some years afterwards another attempt was made to employ these highly-volatile hydro-carbons as lighting materials, by the late Mr. Mansfield, to whom we are indebted for a very excellent investigation of the chemistry of gas tar. His plan was to use atmospheric air as the medium for volatilising the hydro-carbons, chiefly with the view of applying them in this manner for the lighting of country-houses or other places remote from gas works. The material that he employed for this purpose was the more volatile portion of gas tar, now known to chemists under the name of benzol; it possessed a character, however, which proved fatal to the undertaking—it was that of becoming solid when considerably cooled. In consequence of this the reduction of temperature produced by its own volatilization rendered it solid, and stopped its further evaporation.

Strangely enough, this very same plan of using atmospheric air saturated with the vapour of a volatile hydro-carbon has quite recently been put forward with much pretence, as a totally new invention, notwithstanding the fact that Mansfield's patent entirely covers this application of these substances, and that as this patent has expired, the process is now public property.

The nahpthalising of coal gas, though still older, has also been brought before the public lately, under a new name, as being a new invention.

It now only remains to consider how far it may be practicable to use the highly volatile hydro-carbons of petroleum and similar materials for lighting purposes, by diffusing their vapour through atmospheric air. These liquids are free from that prejudicial character of solidifying when cooled, which renders benzol obtained from gas tar, inapplicable for the same purpose. They are now obtained in tolerable abundance in connection with the manufacture of hydro-carbon lamp oils, and they are to a great extent still mere waste products, since they do not answer well as a substitute for turpentine, which is the chief use they have yet been put to. It is, therefore, possible that these liquids might be obtained in sufficient quantity and at such cost as would admit of their being used as lighting materials.

By a reference to the table it will be seen that, as compared with olefiant gas, their illuminating power is considerable. Taking the substance No. 7 as representing the available volatile portion of petroleum, its vapour has $3\frac{1}{2}$ times the illuminating power of olefiant gas; in other words, gas containing $3\frac{1}{2}$ per cent. by measure of this vapour would have the same illuminating power as coal gas containing about 12 per cent. of olefiant gas, and with 7 per cent. of this vapour it would be equal to the best cannel gas.

There is one important point, however, in regard to this application of the volatile hydro-carbons which cannot be overlooked, and which requires to be thoroughly examined before any attempt is made to use them in this way. It is well known that hydro-carbon gases, such as olefiant gas, or marsh gas, the representative of all these hydro-carbons, when mixed with air in certain proportions, form a mixture that is violently explosive. It, therefore, becomes a question of very serious moment whether this fact presents any real or insurmountable obstacle to the use of atmospheric air as the medium for using these volatile oils in the condition of gas. Whether, in fact, under the conditions to be observed for such a use of these oils it would be possible to get a mixture of the vapour and of air that would be explosive when brought in contact with a flame. If that be possible, even in some extreme case, that may be of unlikely occurrence, then there can be no doubt that the use of these oils in that way would be highly objectionable.

It cannot be doubted, looking at the mere possibility of the matter, that with these vapours, just as with marsh gas, an explosive mixture might be produced. There is no question as to that. The question really to be considered is, whether such a result could take place under the conditions for using these oils.

It is well known that the explosibility of a mixture of marsh gas and air, depends upon the relative proportion of the gas and air. For its perfect combustion marsh gas requires 10 times its volume of air. Such a mixture is explosive when brought in contact with flame, and the explosive character still continues when the proportion of air is not more than six or seven times as great as the marsh gas. But when marsh gas is mixed with only three or four times its volume of air, the mixture is not at all explosive, but will burn like the unmixed gas. In the same manner, other hydro-carbon gases require to be mixed with a certain proportion of air to form explosive mixtures; and with regard to the vapours of the volatile hydro-carbons, this is equally the case. In consequence of the density of these vapours being so much greater than that of their representative—marsh gas—they require much larger proportions of air for their combustion. Thus, for instance, the vapour of the oil No. 7 requires 70 times its volume of air for combustion. In all probability such a mixture would be explosive. But a mixture of this vapour with air which would possess an illuminating power equal to cannel gas, would not contain more than 27 parts of air to one of the vapour. Such a mixture, I believe, would not be explosive under any circumstances that require to be taken into account.

Then as regards the possibility of an explosive mixture being formed, it appears to me highly probable that the extreme volatility of these liquids would in itself constitute

a most effectual safeguard against the formation of an explosive mixture. To ensure the efficacy of this character of the oils, however, it would be indispensable that arrangements should be made for securing the intimate contact of the air with the hydro-carbon to be volatilised, and likewise the constant maintenance of a fresh supply of hydro-carbon. All these points, however, are mere matters of detail, which would acquire importance only after the determination of the fact that, with a sufficiently volatile oil, its vapour mixed with air might be burnt like gas without any danger of an explosive mixture being formed. If that were satisfactorily proved to be the case, it is likely that this mode of using those portions of hydro-carbon oils that are still without any satisfactory application, might be introduced with advantage in many cases. Among others I may mention the lighting of railway carriages, and of houses or public institutions situated at a distance from gas works.

DISCUSSION.

Dr. Marcet, F.R.S., understood Mr. Paul as directing attention to the heating action produced by various lighting agents. This property, no doubt, varied very much in the different agents used—some gave out more heat than others, and some evolved more carbonic acid gas than others. Coal gas produced less carbonic acid than petroleum and other substances of that kind. This subject was important in connection with the effect of artificial light upon health. No doubt in rooms where lights were burnt for a considerable time, unless proper regard were paid to ventilation, a large amount of noxious gases were evolved. These gases consisted of carbonic acid, sulphurous acid, and others of a more or less pernicious nature. In some cases in rooms where lights were burnt in which the combustion was not complete, there was a formation of carbonic oxide which was most poisonous. When explosions took place in mines not only carbonic acid was formed, but also carbonic oxide, and these were both destructive of life in a very short time, but each separately had a different action in the destruction of life. Carbonic acid gas destroyed life comparatively slowly, while carbonic oxide immediately struck down any one who breathed it. In the case of the lamentable explosion at the Hartley colliery, which was attended with so large a loss of life, he had no doubt that a mixture of carbonic acid and carbonic oxide was formed, and he hoped, for the sake of the victims themselves, that the latter predominated, inasmuch as their sufferings would be less protracted than under the influence of carbonic acid alone. The action of these gases produced such different appearances after death that it could be ascertained by which of them the death had been caused. Carbonic acid gas rendered the blood left in the veins of a dark colour, while in cases of death from carbonic oxide the red colour of the blood was heightened. The fact of these gases being generated by the combustion of the agents used for lighting purposes made it necessary that the utmost attention should be paid to ventilation. He thought the plan of lighting adapted in the room in which they were assembled was so perfect that it was impossible there could be any accumulation of noxious gases, while the light itself, by being concentrated into one large focus, was of a very efficient character, and ventilation was greatly promoted. The subject of lighting by petroleum having been alluded to by Mr. Paul, he could have wished that some further information had been given with regard to the Rangoon petroleum. From that material had been manufactured a very perfect lighting agent under the title of Belmontine, but he was afraid the supply of that petroleum, as indeed of many other kinds, was considerably on the decrease, but he had no doubt that other sources of supply would be obtained as the original ones failed.

Dr. Bachhoffner said on a recent occasion when they were favoured with a paper on an analogous subject to this, he expressed a somewhat strong opinion with reference to the use of hydro carbons as lighting agents, which opinion he saw no reason to retract. He still maintained that for the ordinary oils of commerce a sufficient guarantee should be given as to their non-inflammability at a temperature below a certain fixed standard; otherwise there was danger in their use for domestic purposes. He did not dispute the correctness of Mr. Paul's statement that, if these oils were used under proper precautions, they would be safe enough: but the great difficulty was to ensure those precautions in ordinary households. Most of the lamps at present in use required to be trimmed and lighted in a peculiar way, and with great care, and this could hardly be trusted to servants. He had no objection to offer against the use of these lighting agents, provided a satisfactory guarantee were given by the retailers of the article that it would not explode at a temperature below 100° at least, though he would rather have a margin of 20° or 30° degrees above that. There was at present a certain amount of danger in the use of these hydro-carbon oils. He was aware that the same objections were raised against ordinary gas on its first introduction. He had no doubt they could easily blow up a house with gas if they were so disposed, but this would only result in most cases from great carelessness. The peculiar odour of gas was a great safeguard in its use, for any escape was at once detected. He remembered there was once an attempt made to deprive coal gas of its odour, but he regarded that as the greatest security they could have against accidents, for if they allowed the taps to be turned on they were apprised of the fact through the medium of the olfactory sense. With regard to petroleum, until there was a satisfactory guarantee when hydro-carbon oils were purchased, that they were not explosive at a temperature below something like 130°, he considered they were not safe for general domestic use.

Mr. Robinson, as one who had had some experience in the use of paraffin oil, fully confirmed the views expressed by the last speaker, as to the necessity for a sufficient guarantee being given as to the temperature at which these oils would inflame. Without that guarantee he considered their use objectionable and dangerous. The system under which they were at present sold was extremely unsatisfactory. A short time since he purchased some paraffin oil which was guaranteed not to ignite upon the application of a match to it in a saucer; but upon testing it he found it ignited very readily. He thought it worthy the consideration of this Society how far petroleum oils might be employed for the purpose of heating steam boilers, instead of as a lighting agent. He thought the use of paraffin and petroleum oils highly dangerous with the present tall lamps, which were liable to be upset by the smallest accident, when the most serious consequences might ensue. He fully concurred in the views of Dr. Bachhoffner as to the desirability of a more satisfactory guarantee being given of the degree of inflammability of these oils.

Dr. Bachhoffner said petroleum had been used in America to a great extent for generating steam in steam-boilers, and a report had been issued showing that it had been attended with certain advantages.*

Mr. Wanklyn thought too much importance was attached to the comparison of lighting materials as regarded the relative qualities of carbonic acid produced in combustion. Ordinary air contained from three to five parts of carbonic acid gas in 10,000 parts of air. Experiments made upon air taken from the most crowded theatres of London showed it to contain not more than fifty parts of carbonic acid in 10,000. If they considered the immense quantity of air there was in a room, and made a simple calculation, it would appear that no description of lighting material they could have could produce an amount of carbonic acid that was likely to have a serious effect upon health. He believed it had never been established that the difference between 5 parts and 50 parts in 10,000 had an injurious effect upon the

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* See page 324, "Use of Petroleum in Steamers."

health; and the probability was that the injurious effects of close air were due to something else, rather than to the slight additional quantity of carbonic acid gas. He believed the amount of carbonic acid present under such circumstances was practically of no moment whatever. With regard to the danger of explosion, petroleum had only recently come into use, and he believed one of the most effectual ways of guarding against this was to use lamps holding only a small portion of oil. To cause an explosion they required air to be mixed with the vapour of petroleum, and it was only when this vapour was present in a large proportion that explosion was possible. When the lamp was full of oil there could be no explosion; the accidents occurred for the most part when the lamp was nearly empty.

Mr. Tegetmeier said, having investigated the circumstances of a great many accidents alleged to have been occasioned by the explosion of paraffin lamps, he had only met with one genuine instance, which occurred at Bethnal Green in the autumn of last year. In that case the lamp was a cheap and badly constructed one; the oil used was inflammable at 110° (disposing of the alleged safety of oil at 100°), and a woman in attempting to put the light out blew down the chimney, which ignited the oil, and the burning liquid was scattered over her, occasioning a considerable amount of injury. With regard to the inflaming point of oil he understood Mr. Paul to put the point of safety at 100°. He (Mr. Tegetmeier) thought the inflaming point should be placed some degrees higher. He had never traced an accident to oil inflaming at over 120°; therefore he agreed with Dr. Bachhoffner that they ought to have a guarantee of safety up to about 130°. As to danger in the use of really good oil, he believed it was practically *nil;* and with oil uninflammable up to about 130°; they might use the lamp in the roughest manner, and even spill the oil, without the slightest danger.

Mr. Paul, in reply upon the discussion, said with reference to the remarks of Dr. Marcet, as to the relative amount of carbonic acid given out by different lighting materials, it was only necessary to say that as the illuminating power of these materials entirely depended upon the amount of carbon they contained, it followed that for a given quantity of light they must yield a given quantity of carbonic acid. In the table given in the paper the various materials mentioned were seen to contain carbon in slightly different proportions, the greatest amount being contained in olefiant gas, which was about 86 per cent., while marsh gas contained about 75 per cent., and the latter had no illuminating power, while the former produced a brilliant light. It was a mistake to suppose that petroleum had an advantage over coal gas in producing less heat: for the production of heat as well as of light depended upon the amount of carbon; the more light, the more heat and the more carbonic acid they had. The only room for improvement in the case of gas, as far as he could see, was with regard to the diluting agents of olefiant gas; these were of three kinds—carbonic oxide, carburetted hydrogen, and hydrogen. These differed in the amount of heat they produced, and carbonic oxide was objectionable from its poisonous properties. The improvement would be to substitute hydrogen for marsh gas or carbonic oxide: still he repeated, for a given quantity of light they must have a given quantity of carbonic acid and a given quantity of heat. The production of carbonic oxide under the circumstances in which gas, petroleum or candles were burned, seemed to him to be beyond the range of possibility. Carbonic oxide could only be produced by the combustion of carbonaceous substancss where there was a deficiency of oxygen. When a light was burnt with insufficient air the consequence was smoke, which preceded the production of carbonic oxide, and gave sufficient warning of the risk. There was a method of lighting which had been tried, which he had no doubt would eventually be successful, and would be largely used, in which the light was obtained without any carbonic acid being produced. He referred to the lime light, in which the solid substance, instead of being carbon, was a piece of lime, intensely heated by the flame of oxygen and hydrogen. The possibility of using that plan of lighting for ordinary purposes rested upon one circumstance, viz., the production of cheap oxygen. If this could be cheaply supplied there would be no further difficulty about the lime light: but under present circumstances the improvement that could be made in the existing methods of lighting consisted in better modes of ventilation, such as were adopted in this room—a principle first introduced by Faraday, and one which might be regarded as perfect in all respects. With regard to the Rangoon petroleum, the history of it was very simple. It was an extremely good material for the manufacture of hydro-carbon oils, the best of the kind being that known as the Belmontine, of Price's Candle Coy., but the cost of Rangoon petroleum in this country was from £20 to £25 per ton, while the American was supplied at from £12 to £18. It did not therefore require many words to say why Rangoon petroleum was not used. With regard to American petroleum he was far from enthusiastic about the future of that. He was disposed to think the oil distilled from coal and other similar minerals would become the staple material for the production of these illuminating oils. With regard to the alleged danger attending the use of these materials, he must say he could not agree with the apprehensions entertained by gentlemen whose opinions, however, were deserving of great respect. The idea of being limited in the use of these materials by the stupidity of domestics was a thing he did not like to submit to. The probability of a gas tap being left with the gas escaping was quite as great as that of any blunder through which an accident might be produced by the use of petroleum. Of course in the use of all these materials a reasonable and proper amount of care must be exercised, and, as with ordinary gas, they must have proper apparatus for burning these oils, which apparatus must be carefully managed. The fact that these oils could afford light in country places, where gas was not obtainable, at a price of little more than half as much again as gas, was sufficient to prove that they were a considerable boon to the great mass of the people. There was another fact which was not sufficiently attended to—that was the enormous aggregate consumption of these oils. There were several factories which turned out 30,000 gallons of oil per week, and the number of accidents they heard of was infinitely small when compared with the extent to which these materials were used. At the same time it was quite proper that it should be settled by competent authority what should be the standard of safety in these oils. The Act of Parliament, passed some time ago, unfortunately only applied to the storing of petroleum and other inflammable substances, and left out of consideration other important points. The Act merely provided that not more than 40 gallons of oil, lighting at a temperature below 100°, should be stored within a certain distance of a dwelling house; but less than 40 gallons of such oil, if ignited, might occasion very serious damage. With regard to the temperature of ignition, if it were possible to use oil that would light at 100° with perfect safety, provided they used proper lamps in a proper way, it was desirable that no impediment should be placed in the way of doing so; at all events, the question should be settled, and the absolute degree of safety established. With regard to the use of these materials for fuel, that admitted of very simple comment. He was aware they had been tried in America, but a slight consideration of the composition of petroleum would show that this was not likely to answer commercially. The heating power of petroleum was not more than $1\frac{1}{4}$ times that of coal, and while the price of petroleum in this country was about £18 per ton, coal was about £1 per ton. From this fact alone they might judge how far the application of petroleum to heating purposes in manufactures was practicable.

Mr. Symons said that the assertion of Mr. Paul—that heat bears a constant proportion to light, did not agree with the experiments of Dr. Frankland. According to the published tables of those experiments, the heat produced did not bear any constant proportion to the amount of light evolved.

The Chairman thought they could not but feel obliged to Mr. Paul for the interesting paper he had brought before them this evening, and also for the further observations he had been kind enough to make on matters arising out of the discussion. The subject of lighting was a very interesting and important one, both as regarded the lighting of towns and the interior of dwellings. Those who had been in any of the towns of the East, which were entirely unlighted at night, except by the small lanterns people carried about with them, would not be surprised at the fact, that when the Turkish Ambassador came to London, he thought the city was illuminated in honour of his arrival, though the only lights used at that period were oil lamps. He might mention, that long after the introduction of gas into Newcastle-upon-Tyne, he saw a house there blown up by gas. The singular fact connected with this occurrence was, that in that house no gas was laid on; but the pipe for the public lighting having burst, the gas found its way into the house, and the servant, going about with a lighted candle, produced the explosion, which was attended with very serious consequences. That accident, at the time, was very likely to lead to a supposition that gas would prove a very dangerous thing, and that accidents of that kind would be of frequent occurrence. Yet it was the only instance of the kind he ever heard of, and 40 years had passed over without the repetition of such an occurrence, showing how erroneous a view might be entertained as to the question of danger. Reference had been made to the application of these oils to heating purposes. That was a subject well worthy of most careful consideration, because everything that tended to economise coal must tend to the duration of this country as a great and powerful nation. The Chairman concluded by moving a vote of thanks to Mr. Paul.

The vote of thanks having been passed,

Mr. Paul, in reply to what had fallen from Mr. Symons, said he thought Dr. Frankland would be the last person to dissent from the view he had put forward as to the amount of light, and consequently of heat produced, being in direct proportion to the amount of carbon contained in the vapour burnt. As to the reason why the oxy-hydrogen blow pipe did not give light in proportion to the heat, it was simply from the fact that the gases burnt contained no carbon, and yielded no solid product.

Proceedings of Institutions.

Ashton and Dukinfield Mechanics' Institution.—The report for last year congratulates the members upon the prosperity of the Institution. The number of members is now larger than at any previous period in its history, although it is far below what it ought to be. There is ample accommodation for double the present number of members. The list of honorary members, although larger than at any previous period, is not commensurate with the wealth or intelligence of the town. During the past year two lectures have been delivered in the Institution, in both instances free of charge. The committee suggest the desirability of inaugurating a course of lectures with occasional meetings of a more social and entertaining character. The chess and draught rooms are well attended. During the past year a Discussion Society has been formed, and has proved a decided success. Papers upon various interesting subjects have been read and discussed. The meetings of the society are held in the winter months, and it numbers fifty-five members. A "Field Naturalists' Society" was projected rather late in the season, but several very interesting excursions were taken in the immediate neighbourhood, and the natural history of the district investigated. Combining both pleasure and profit—the study of natural history amidst natural scenery—this society has many points of attraction. To ladies it offers, in conjunction with the library, opportunities for mental culture and recreation which no other department of the Institution possesses. The number of member is 520, being an increase of twenty-nine on the former year, seventeen of whom are factory operatives. The partial improvement which has taken place in the staple industry of this district since the last annual meeting has resulted in an increase in the class of factory operatives of 33 per cent. The classes now in operation are, writing, arithmetic, grammar, geography, and mathematics, meeting four evenings in the week; French, meeting once a week; mechanics, architecture, and free-hand drawing, meeting once a week. In the library, the present number of volumes is 3,470, being an increase during the year of 130. The total number of issues was 7,225.

Greville House Working Men's Library and Reading Room, Paddington.—The seventh annual report says that there is a circulating library of nearly 1,300 volumes, an increase of 100 over last year. The number of members on the books at present is about 230 (about the same as last year), of whom about 10 pay extra, and avail themselves of the classes, or some of them. The number of books taken out of the library during the year was about 3,500. The last twelvemonth has witnessed a great movement for the promotion of clubs for working men Mr. Gladstone, in a recent speech in Flintshire, had said. much on the advantages of institutions of this kind. Greville House has for several years exhibited a practical example of the working man's library and reading room, in conjunction with educational classes. As the "Club" feature of such institutions is just now attracting attention, it may be mentioned that coffee is to be had on the premises, and that a smoking-room is provided. The continuous steady work of the classes, the examinations for prizes, and the other educational machinery, prove, that the means of moral and mental improvement are afforded, while the agreeable scenes presented by the soirées of the members, and the pleasure afforded by an occasional lecture or other entertainment of an avowedly amusing character, show that innocent recreation is not forgotten. Last year's report contained the usual notice that prizes had been offered for the study of works of useful information, and it was mentioned that the subjects then proposed were, "Lessons on Morals," and "The Science of Health." As on former occasions a smaller number of competitors came forward than could have been desired, but those who did so acquitted themselves well. The prizes were awarded as follows:—"Morals," W. Peters, 1st prize, G. Anderson, 2nd prize; "Science of Health," Mr. Burch, 1st prize, Mr. Carrier, 2nd prize. These prizes were distributed at a public meeting, when Lord Ebury took the chair. The subjects for examination for 1864 are Blunt's "Sketch of the Reformation in England," and "The British Settlements in India," a work published by the Society for Promoting Christian Knowledge. During the past year the Institution has been brought into union with the Metropolitan Association for Promoting the Education of Adults. The Bible class goes on steadily. During the last summer some disappointment was felt from the utter failure of every attempt to obtain a cricket-ground. It is much to be regretted that in the present state of London it is next to impossible for the working-man to share in recreations of this kind. During the summer evenings the Greville House band performed every Saturday evening on Paddington-green. During the autumn months a gymnastic class has been held in the large room of the Institution. Lectures have, as heretofore, been regularly given every week, during spring and winter, and the committee express their great

obligations to the friends who have kindly come forward to take part in the course. The annual soirée of the members took place, and was most successful.

THE ART-WORKMANSHIP PRIZES.

The following is from a correspondent:—

In considering the second series of prizes which is now offered by the Society of Arts for the best, and the second best, specimens of "Art-Workmanship," it is important to recollect that the purpose of the Society is not, in the first and largest division of the series, to call for what is commonly styled "design," even in its humblest form of adapting existing materials, but for workmanship *per se.* An appeal is made to those numerous classes of skilled artizans whose crafts are exercised in the debateable land that lies between art and labour. The Society acts on the conviction, which has long been entertained by those acquainted with the subject, that our skilled workmen rarely have opportunities for studying, in the practical manner which a competition involves, those admirable examples of successful production in their respective crafts which the past has stored up for us. It is desirable to put models of perfect workmanship before men whose powers are frequently limited in scope, and whose knowledge is too often technical, or, to speak strictly, merely practical in its nature. By doing this the technical ability of every competitor is worthily tested, and even those who are unsuccessful in the trial must profit by a noble kind of practice.

These are the general and direct objects of the Society. The system by which it is attempted to carry out those objects has several points which we would commend to workmen:—1. The prizes are liberal in amount, ranging from £3 to £20; the scale in each class being carefully adapted to the nature of the work required, the cost of production, &c. 2. Competitors may execute their tasks after working hours, so that they need not interfere with current duties of the workshop. To this end ample time is given for production, and that time which is most convenient for the tasks, *i.e.*, the season of long days has been designated. Works are not to be sent in to the Secretary of the Society of Arts till the 26th November next. 3. The works produced are to remain the craftsman's own, whether premiated or not; and the only condition attached to the competition by the Society, with regard to possession of the same, is advantageous to competitors. This is, that all specimens shall be retained a reasonable time for exhibition. This exhibition will probably take place at the South Kensington Museum, or else in the House of the Society of Arts. 4. Models, either in the form of casts or of photographs, are obtainable at the mere cost of production. 5. All the models selected by the committee of the Society appointed to deal with this matter are such as admit of the works produced from them being brought into use so as to have a commercial value of their own in each instance, independent of that attaching to the character of examples which have been honourably distinguished. With a view to enable competitors to dispose of their works the Society calls upon the makers to state the price at which they may be sold, or, should they be sold before they are sent in competition, that at which a copy may be had. It is needless to point out to workmen or employers the advantages attending success in competitions such as these. In point of fact the Society of Arts undertakes all the expense and trouble of getting up an exhibition of competing works, rewards the skilful, and makes their names known over the length and breadth of the land.

The second division of the series of prizes is for works executed without prescribed designs, and embraces in its subjects the human figure, animals, foliage, fruit, grotesques, etc. The first prize in this division is the Society's silver medal and £25. Of course its subjects involve "design" as well as execution. The Society, with great consideration for the peculiar circumstances of those whom it invites to compete for its prizes, has instituted a second set of prizes, of the same amount in each class, for female competitors only, although all classes are open to them. The additional set of prizes comprises painting on porcelain, decorative painting, and the production of wall mosaics.

From the list of examples set forth by the Society I propose to select such as appear to admit of special remarks upon their character, their history, and those points in their execution which deserve particular consideration.

It is difficult to conceive a finer example of execution, or one better fitted for application to modern uses, than the beautiful group of a boy and dolphin, which is offered as the theme for the first prize in Class 1, carving in marble, stone, or wood. Such a work may be employed as a bracket, as a console, or cantilever; it might be placed over a fireplace, under a balcony, or in any other similar situation. The subject is one of those spirited themes so often adopted with perfect success by the great Italian sculptors, who gave their attention to the production of decorative works. A winged boy is placed astride of a dolphin, and guides it by reins held in the right hand, while with the left he grasps a flag and waves it behind him. An appearance as of rapid motion is imparted with admirable skill, by the flying hair of the child, by the full-blown character of the banner, and, principally, by the plunging attitude of the dolphin; note also the clinging of the thin drapery that clothes the part of the boy's body as an exquisite example of drapery employed so as to become expressive in itself. Every part of the execution of this work is worthy of careful study. Even the subordinate parts of the scroll which form the console itself are designed with perfect taste. See the bold, yet graceful, curve given to the mouldings, the fine treatment of the line of decorations on its front, composed of a modification of the "egg and tongue" ornament, showing scallops and tongues placed alternately. No carver who loves his work will omit to deal carefully with the beautiful "rosettes" of open lotus-flowers which, on the sides of the model, form the eyes of the scrolls. Competitors who use the full sized cast of this sculpture which the Society supplies will have a decided advantage in dealing with it. Good as the photograph is, much of the detail is out of its range. The dolphin, the filmy fins and almost animated tail of which are remarkable for design and treatment, deserves special attention. In the latest edition of the inventory of the South Kensington Museum the original of this work is numbered 5; its "Register," or permanent number, is 5,896. It is ascribed to Donatello (?), the sculptor of the famous "David" and "St. George," a Florentine, born 1383, died 1466. Competitors who may resolve to work from the photograph only, and not to avail themselves of casts from the actual object, are earnestly recommended to examine the casts, which will be deposited at the house of the Society of Arts, Adelphi, London, at the South Kensington Museum—where also the original is readily accessible—and at the Schools of Art in Edinburgh, Dublin, Manchester, Glasgow, Birmingham, and Hanley in the Potteries. This recommendation applies to all the other works, copies of which may be seen at the above-named places.

The second example to which I shall call attention is that proposed as the model for the prize offered in class 1 for ornamental work. In this case, as in the last, copies will have to be produced in marble, stone, or wood. The model is a carved chair-back, dating from about the end of the fifteenth century, copies of which may, however, be adapted to uses other than that of the original, *e.g.*, the work, if reproduced in wood, might be applied as a panel on the door of a wardrobe, or other similar office admitting of flat decoration. Some parts of the example have, as far as regards art-value, much greater interest than others. The head of a terminal-winged figure is surrounded by festoons, from behind the pedestal of the figure issue some beautiful scrolls of natural foliage, beneath is a cartouche, having in its centre a lion's head. The treatment of the body of the

terminal figure is highly objectionable, not to say bad, in art; the head of the same has not much to recommend it, the festoons, of which there are several subordinate repetitions, are good, but rather commonplace. The cartouche, notwithstanding that it offers, in the bold and yet precise characters of its elements, many opportunities for the display of skill in carving, cannot be quoted as valuable in its designs; few cartouches of this date have any pretension to be ranked as works of art. The admirable part of the composition, and that which will try the skill of competitors, is the foliage, of very simple and elegant character, which issues from behind the pedestal, and spreads itself over the flat ground of the object in exquisite spiral forms. Here, indeed, is a model worthy of study, and of the most thoughtful imitation. The round and firm, yet, so to say, fleshy branches, which hold the leaves and their berries, can hardly receive too much attention. The skilful union of the stems with their adjuncts, the modelling of the crisp leaves and of the dexterously-placed berries is delightful. That valuable element of ornamental work, the grotesque, is here represented by the lion's head, and is a most unfortunate example, its sole merit being that of flatness, which is estimable in a work of this class, and sustains the style of the whole.

The second example offered for reproduction in the section of ornament (class 1), although a much less elaborate one than that last named, is wholly satisfactory. It is a fine bracket, or corbel, made to receive a vaulting-shaft, an example of "stiff leaf foliage" of transitional character, approaching to the style of the Decorated phase of Gothic art. It suggests nearly all the beautiful design and execution of the similar works in Wells Cathedral (south transept). Although it is suggested by the committee that "the details of this model may be improved by the introduction of small animals," it cannot be averred that the work is not perfectly adapted for its original use as a corbel, and to be seen at a considerable distance above the eye. In accordance with its situation the carver arranged an interval between the two masses of foliage, and, in order to get richness and lightness of appearance, as well as depth of shadow, he cut away that interval boldly, leaving only the stems of the upper mass of foliage marked between the two ranges or crowns of leafage. Considered in its proper aspect nothing can excel this work in spirit or beauty of composition. The treatment of detail is admirable. The human head—which has been introduced with thoughtful appreciation of its position in a building, in which place probably the whole was carved—is an excellent grotesque, and the intelligence displayed in its production is infinitely superior to that which contented itself with the inane lion's head of the last example. Time, neglect, and the white-wash brush have done their worst upon the original; the mould from which the copy in the Architectural Museum was taken was doubtless a mere "squeeze." We have, in the cast before us, a mere translation, yet the work will arrest the attention of all students, and modellers may be able to restore the damaged surface in their reproductions, but they must think deeply ere they will be able to introduce new elements into the design which will not do more harm than good. If such new elements are introduced with beneficial effect the work will be fitted for other uses than that of the original. "Design" will be called into play here by competitors who attempt to improve the model; probably on this account the committee makes its reference to such "improvements" permissive only, and not conditional.

This subject will be resumed in a future number.

Fine Arts.

Fine Art in Paris.—The exhibition, now annual, of the works of living artists, which is to open on the first of May, is attracting unusual attention, although only half the usual time has elasped since the last *salon*. The cause of this is in the changes that have been made in the constitution and direction of the Imperial Schools of Art, and with respect to the prizes for the exhibition itself. This year, for the first time, the greater portion of the jurors, three-fourths of the whole, are named by the body of artists who have received medals or decorations. The election took place some days since at the Louvre, when the following were selected:—Messieurs Cabanel, of the Institut, Professor of the Imperial School of Fine Arts; Robert Fleury, also member of the Institut and Director of the Imperial School; Gérôme and Pils, Professors of the School; Bida, Français, Fromentin, Corot, and Meissonier, of the Institut; with H. Flandrin, Gleyre, and Leon Cogniet, the first and last members of the Institut, as supplementary members. The list of names selected by the artists exhibits a good understanding between them and the Imperial establishment on the one hand, and the Institut on the other, and sets at rest all fear relative to popular election of the juries. The members elected in the section of sculpture are, all but one, members of the Institut or of the Imperial Schools; and the selection in the case of the other juries is equally remarkable. Since the election referred to took place, the Administration has nominated the remaining quarter, the list being as follows:—In painting—Duc De Morny, M. Théophile Gautier, and M. Reiset, one of the Conservators of the Louvre. In sculpture and medal engraving—M. de Longpérier, of the Institut and a Conservator, and M. Paul de Saint Victor, a literary man. In engraving—M. Henri Delaborde, Conservator; and in architecture—M. du Sommérard, the Director of the Musée de Cluny. A jury thus selected ought to give satisfaction, and to prevent the necessity for a painful exhibition of the rejected works like that which took place last year. At any rate the working of the new system will be watched with great interest as an important experiment, not only by Frenchmen but by foreigners. Juries are irresponsible tribunals entrusted with serious duties, and it certainly cannot be said that the world has yet arrived at any very satisfactory opinion respecting either the method of their election or the principles of their action. Almost at the moment of the election of the juries in question, one of those named, and one of the best artists of France of the present day, M. Hippolyte Flandrin, expired suddenly at Rome. M. Flandrin's minor works are well known abroad as well as at home, and amongst these, the most prominent, perhaps, are the portrait of a "Girl with a Poppy," and that of Prince Napoleon; but his highest claim as an artist rests on his religious works, including, amongst many others, the mural paintings in the churches of Saint-Vincent-de-Paul and Saint-Germain-des Prés. The latter include no less than twenty principal subjects and forty separate figures; and, unfortunately, the work is left unfinished. M. Flandrin was a pupil of M. Ingres, but he had entirely quitted the path of his master in the matter of colour. "The camp of colour and the camp of form," said Théophile Gautier the other day, "have each lost a chief." The Government has given M. Benedict Masson a commission to decorate the walls of the cloisters which surround the Court of Honour of the Hôtel of the Invalides. The four walls measure each about 150 feet long by 16 feet high. M. Masson has selected for subjects—the ages of Charlemagne, Saint-Louis, Louis XIV., and Napoleon. The vaultings of the ceiling are also to be decorated. The walls have been scraped and primed, and are now ready for the artist. The Chemin de Fer du Midi has performed a graceful act towards art by reducing the charge for carrying pictures and other works for the exhibition, to be held at Toulouse in the month of May, to one half the usual prices. The Imperial museums have received a large number of presents of late, some of great value; amongst the most recent are a bust in marble of the Countess de

la Forté, a very charming work, attributed either to Germain Pilon or Jean Gougeon; and a bas-relief representing the Virgin and Child, by Mino de Fiésolle, who died in 1486. There has been a very remarkable work of gold lately exhibited at the entrance of the choir of the Cathedral of Notre Dame. It is a new reliquary, manufactured at the expense of the chapter, after a design prepared by M. Viollet Le Duc, and contains an immense number of diamonds and other precious stones, the result of pious offerings. St. Louis is represented sitting on a throne, wearing a crown of rubies and emeralds, and holding the crown of thorns in his hand. St. Helena, with the Holy Cross, and Baudouin II., Emperor of Constantinople, are likewise seated on thrones. There is a platform over the head of these three personages, resting on the top of the thrones, of which the disc is surrounded by a river of diamonds. Turquoises are scattered over the surface, and in the centre is a pillar formed of enormous emeralds, which bears a crystal lantern, round which are the Twelve Apostles. The reliquary, which is silver gilt, cost £2,200. The diamonds and precious stones are estimated at £8,000.

Female Art Students.—A memorial, bearing the signatures of twenty-three female students connected with the South Kensington and other art schools, who purpose to become professional artists, has been presented to the members of the Royal Academy of Arts. The memorialists state that it has long been the custom of the Royal Academy to admit into their school new students to supply vacancies, and that the students have been usually selected by means of an examination of works executed for the purpose; that for some years past, and up to the year 1863, it was permitted to female students to compete at these examinations, but that in June, 1863, two female students of the South Kensington School of Art sent in to the Royal Academy drawings executed by them for the purpose of competition, when, by a resolution of the Council, it was determined that their works should not be submitted to competition, and that no more female students should be admitted into the schools. The memorialists complain of that resolution, urging that the current of opinion and feeling of late years, on the part of the educated public, has been strongly in favour of the introduction of women to such callings and pursuits as are suitable to their sex, capacities, and tastes, and that one channel which has in modern times been opened for the enterprise of women is the pursuit of the arts of sculpture and painting, and that many women have availed themselves of that opening, and are at present earning their livelihood as artists; and that many other young women are preparing themselves by study and practice to follow their example. The memorialists, therefore, urge that with the view of their becoming really good artists, they ought to receive the best art education compatible with the circumstances, and that this is only to be had in the schools of the Royal Academy, which are the only free art schools in this country. The only reason alleged by the Academy authorities for excluding them was that the accommodation for students was limited. The memorialists, however, urge that they do not ask that any favour be extended towards the female competitors at the entrance examination, so that the entire number of students will not be increased. They merely desire "a fair field and no favour." In conclusion, they "pray that liberty may be restored to female students to compete for admission into the schools of the Royal Academy, upon the same terms and conditions as male students."

Manufactures.

New Barometer.—This barometer consists of a column of mercury placed in a glass tube, hermetically sealed at the top, and perfectly open at the bottom. The lower half of the tube is of larger bore than the upper. If a column of mercury, of exactly the length which the atmosphere, at the given time, is capable of supporting, were placed in a tube of glass, hermetically sealed at the top, of equal bore from end to end, the mercury would be held in suspense; but immediately the pressure of the atmosphere increased, the mercury would rise towards the top of the tube, and remain there till, on the pressure decreasing, it would fall towards the bottom, and the portion which the atmosphere was unable to support would drop out. If, however, the lower half of the tube be made a little larger in the bore than the upper, then, when the column falls, the upper portion passes out of the smaller part of the tube into the larger, and, owing to the greater capacity of the latter, the lower end of the column of mercury does not sink to the same extent as the upper end, and the column, as a matter of course, becomes shorter. This falling will continue until the column is reduced to that length which the atmosphere is capable of supporting, and the scale attached thus registers this fall, or what is ordinarily termed the height of the barometer. From the above description it will be evident that, by merely varying the proportions in the sizes of the two parts of the tube, a scale of any length can be obtained. For example, if the tubes are very nearly the same size in bore, the column has to pass through a great distance before the necessary compensation takes place, and a very long scale may thus be obtained, say ten inches for every one inch rise and fall in the ordinary barometer. But if the lower tube is made much larger than the upper, the mercury passing into it quickly compensates, and a small scale, say from two to three inches for every inch, is obtained. To ascertain how many inches this rise and fall for an ordinary inch of the barometer would be, the inventor, Mr. Hicks, of Hatton-garden, attaches his barometer with a standard barometer to an air pump receiver, and thus ascertains the scale for every inch, from 31 to 27 inches. On the same principle, as regards the tube, the inventor has constructed an absolute standard barometer, graduating the scale from the centre, and reading it off at each end of the column with two verniers, to the one-thousandth of an inch. To ascertain the height of the barometer graduated in this way, he takes a reading of the upper surface of the column of mercury with one vernier, then of the lower surface in the same way with the other vernier, and by adding the two readings together, he gets the exact length of the column of mercury supported in the air, which is the true height of the barometer at the time. Gay-Lussac's pipette is introduced into the centre of the tube to prevent the possibility of any air passing up into the top. Such a barometer is convenient for measuring mountain heights, being very portable and getting rid of the cistern, and the corrections necessary when this is used.

New Maximum Thermometer.—The novelty in this thermometer consists in the addition, near the bulb, of a small tube at right angles to the tube of the thermometer, and in connection with the bore; and when the thermometer is placed horizontally, this tube stands perpendicularly above it. On an increase of temperature taking place, the mercury will rise in the small bore, as in an ordinary thermometer; but on the temperature decreasing, instead of receding, in the small bore, as in an ordinary thermometer, the mercury in the bulb, on contracting, draws with it the mercury from the small side tube, and the then column of mercury in the small bore registers the maximum temperature. To reset the thermometer for future observation, lower the end near the bulb, and allow the mercury to fall until it fills the small tube at the side, then the thermometer shows the temperature at the time, and is set for a future observation.

Monster Steam Hammer.—Messrs R. and W. Morrison, of Newcastle-on-Tyne, have just forged what is believed to be the largest and most powerful steam hammer in the world, for the Russian Government. The piston rod, to which the hammer is attached, weighed no

less than 42 tons in its rough forged state, and now, when dressed down to the required dimensions, it has only been reduced to 35 tons. The length of the piston rod is 38ft., the diameter 2ft. 4 in., having a stroke of 14ft. 6in., the piston being 6ft. 8in. The forging of this mass of metal occupied 44 days. The cylinder for this hammer was cast at the Elswick Engine Works. Its diameter inside is 6ft. 8in., its weight upwards of 40 tons. The two standards weigh nearly 40 tons each.

Indian Cashmeres.—Baron Charles Dupin has just published another section of his voluminous report on the Great Exhibition of 1851, being a continuation of that division of the work entitled, "The productive force of nations," and having reference to India, its population, society, and productions. "Of all the textile fabrics of India," says Baron Dupin, "the cashmeres made from the 'silky down' of the goats of Thibet have, at present, the greatest interest in European eyes." During the past half-century the influence of European commerce has worked a great change in these rich productions; an examination of those manufactured, say in 1800, will show how unpretending they were in comparison with the rich and sumptuous articles seen in London in 1851; the former were generally simple as regards decoration, with narrow borders and light embroidery. Baron Dupin says, that if he were engaged in the commerce of cashmeres, he would send out, not designs, but designers to India, and would say to them:—" Contemplate, study the brilliant nature to be found there; compare the marvellous effects of light on the plants of Asia, at break of day, at mid-day, in the evening even, when the sun has disappeared; acquire the taste, the genius of oriental artists, and then you may design cashmeres which will charm at once both east and west."

Museum of Patents, Kensington.—It is highly desirable that this museum should be so constituted as to become an historical and educational institution for the instruction of skilled workmen. Amongst the various things necessary to be done in order to accomplish this object it is considered to be of importance that machines and exact models of machines, in subjects and series of subjects, showing the progressive steps of improvement in each branch of manufacture, should be exhibited. For example, taking the case of steamboats; in order to show the rise and progress of this invention, it is intended to exhibit in a series of exact models of machines, or by the machines themselves, each successive invention and improvement in steam propellers, from the first engine on the paddle system that drove a boat of two tons burthen (now in the museum) to the powerful machinery of the present day. Various interesting original machines and models of machines have lately been added to the museum. Amongst them may be mentioned a model of Trevethick's locomotive engine, the first that ran upon common roads, in 1803; an original stationary and pumping engine made on Newcomen's principle, to which Watt applied his important invention for condensing, by the means of a separate vessel and air pump, the steam that had been used and formerly condensed in the cylinder; the original fixed engine made by Watt in 1788, for converting rectilinear into circular motion; the very early original locomotive engine, brought from the Wylam Colliery in Northumberland, the first engine which moved by the contact of smooth wheels on smooth rails; the original "Rocket" locomotive engine, made by Stephenson and worked at the opening of the Liverpool and Manchester railroad in 1829; the original paddle wheel engine known as the "Comet engine," constructed and worked by Bell, on the Clyde, in 1811, the vessel worked by it being the practical commencement of steam navigation in Europe. Any patentee or other person desirous of assisting in furnishing complete series of models of machines, either by making a gift of a machine or model, or by the loan of a machine or model to be used as a pattern, is requested to communicate with the curator or the superintendent, at the museum. A collection of portraits of inventors has been made, and placed in the Museum of Patents. All persons possessed of portraits or busts of inventors are invited to contribute to this collection, either by gift or loan. All expenses attending the removal, carriage, or repairs of any machine, model, or portrait contributed to the museum, will be paid out of the funds of the museum.

Commerce.

Use of Petroleum for Steamers.—Further information has been received of the results of the inquiry of the commissioners appointed by the American government with regard to the use of petroleum for steamers, recently referred to in the *Journal*. The commission consisted of three persons, including the chief engineer of the United States Navy, and their investigations extended over five months, the process for adapting the oil for this purpose having been patented by Shaw and Linton, of Philadelphia. They were instructed to report "the relative evaporative powers of the oil as compared with anthracite coal, the practicability of its use, if unattended with danger, and to set forth its advantages, if any." As regards evaporation, the reply was that it is 103 per cent. superior in power to anthracite coal, while the time required for generating steam to 20lb. pressure was only 28 minutes against 60. The commissioners accordingly recommended the Secretary of the Navy to introduce the oil on board one of the Government steamers to determine practically its economical efficiency. The advocates for its introduction contend that in a vessel like the Cunard steamer *Persia* the saving, taking into account the smaller space required, and all other advantages, would amount to £2,400 each trip. Experiments on a large scale, it is added, will speedily be made in an ocean steamer by a company to whom the present patentees are about to transfer their rights. In addition to the discovery of extensive deposits of the oil in Southern Russia large quantities are alleged to have been found on the Pacific in California. The calculations as to economy, however, seem to have been based on the assumption that the price would remain as now after the increase of demand, and also upon the cost of coal in America, and not in England. Should the results, it is added, "equal what may be fairly anticipated, steam navigation will be revolutionised. A war steamer with oil fuel could hold the sea twice as long as now, and lines of commercial communication now too far apart, from the difficulty of carrying sufficient coal, would then be formed with ease. Direct lines from New York to Australia and between California and China would be of easy accomplishment."

Royal National Life-Boat Institution.—The annual general meeting of this Institution was held on Tuesday, the 15th ult., at the London Tavern, Sir J. S. Pakington, Bart., M.P., in the chair. The meeting was influentially and numerously attended. Mr. Richard Lewis, Barrister-at-Law, Secretary, read the annual report, which stated that on this, the fortieth anniversary of the Institution, the committee had once more to place on record the success which had rested on their labours, and to express their gratitude to a liberal public for its continued generous support. Perhaps the most striking feature in the history of the Institution during the past year was the large number of noble gifts, in the shape of the entire cost of twelve new life-boats, which had been presented to it by philanthropic individuals. The committee had the gratification to know that the Lords of the Admiralty were taking steps to provide every ship-of-war with an efficient life-boat, their lordships having paid the Institution the compliment to consult it on that important subject. The Committee propose to build and place at some of the principal fishing stations model or standard insubmergible fishing-boats, from which, after sufficient trial, others might be built in the

several localities; and thus a permanent improvement be established, which might lead to the saving of many lives on occasions of such boats being overtaken by gales of wind when at long distances from land. During the past year the institution has been enabled to send no less than 15 new life-boats to the coast, and numerous others were in course of construction. The life-boats of the institution numbered 132; and some of them were the means of saving no less than four hundred and seventeen lives and seventeen vessels during the past year, nearly the whole of them under dangerous circumstances, amidst high surfs, when no other description of boats could have been launched with safety. For these services—and for saving 297 shipwrecked persons by fishing and shore boats or other means—the Institution had granted rewards amounting to £1,351. On occasions of service, and on those of quarterly exercise of the life-boats, about 6,000 persons were afloat in them, yet not a single life had been lost. Transporting carriages and boat-houses had been provided for most of the said new life-boats. The committee reported that the number of wrecks during the past year was very large. During the time, however, that these storms lasted, the life-boats were providentially the means of rescuing no less than 385 shipwrecked persons. 1,602 casualties took place last year on the shores and in the seas of the British Isles, accompanied with loss of 568 valuable lives. During the same period 4,565 persons were rescued by life-boats, the rocket-apparatus, shore-boats, and other means. The number of lives saved during the forty years from the establishment of the Institution in 1824, to the end of the year 1863, either by its life-boats, or by special exertions for which it had granted rewards, was 13,568. During the past year fifteen silver medals, twenty-six votes of thanks inscribed on parchment, and £1,297 in cash had been granted for saving the lives of 714 persons by life-boats, shore and fishing-boats, and other means, on the coast and outlying banks of the United Kingdom. Since the formation of the Institution, it had expended on life-boat establishments nearly £100,000, and had voted 82 gold and 738 silver medals for saving life, besides pecuniary awards, amounting together to £17,830. The Committee referred to the cordial co-operation of the local Branch Committees, the Board of Trade, the Coast Guard, and the Railway and Steam Packet Companies. The expenditure of the Institution in the year 1863, on its life-boat establishments, was £11,377 14s. 1d; £1,351 6s. 4d. in rewards for services to shipwrecked crews; and £2,441 9s. 1d. for coxswains' salaries, and the quarterly practice of the boats' crews. Considering the magnitude of the operations of the Institution, embracing the whole of the coasts of the British Isles, a large permanent annual income was indispensable to enable it to maintain, in an effective state, its one hundred and thirty-two life-boats, and to increase their number, should circumstances render it desirable to do so. The report was unanimously adopted.

Colonies.

Railways in New South Wales.—The plans and working sections are finished for a further length of fifteen miles on the Great Northern Railway, and tenders will shortly be called for the formation of the line. The estimates for the extension from Blackheath as far as Lithgow's Valley on the western line, are in a forward state, and they will probably be laid before Parliament this session. The Government were lately taxed in the Assembly with not having placed on the estimates for 1864 a further sum for the Great Western Railway Extension, as the completion of the forty miles contracted for will, at the engineer-in-chief's estimate of £10,000 per mile, considerably exceed the sum voted for the Western Extension—£250,000. It was, however, explained that there would be no use in obtaining a further vote at present, as it would be several months before the contracts were finished, after which the lines would have to be ballasted and the permanent way laid. The works on the Western Extension are steadily advancing towards completion.

Tasmanian Agriculture.—As compared with January, 1863, the present season opens with better prospects for the farmers, and the new crop promises to be at least an average. This colony has hitherto been free from rust, which has all but destroyed the crops in New South Wales, and all the grain that can be spared from this will be required for that colony. Victoria will also be a large importer, as its own produce will not nearly supply its consumption, whilst New Zealand, having, in consequence of the war, produced but little, will require to import largely. Labour is not so abundant as is required for the harvest, and no desire has yet been shown to use the reaping machines, of which there are a few in the colony. These machines are now general in Adelaide and Victoria. Sheep-shearing is now all but finished, and with satisfactory results. Fat stock from Victoria continue to come over by every steamer. Some of the settlers are now directing their attention to the breeding of rams, for the purpose of supplying the northern stations of New South Wales and Queensland, where it is found that the climate deteriorates the quality of the stock. There is a general desire for an intercolonial show of sheep in Tasmania this spring.

Tasmanian Immigration.—The want of female labour is now much felt throughout this colony, especially in the country districts. Male farm labour is also getting scarce, but the cry for it is not so great as that for female.

Coal in New Zealand.—At this moment the consumption of coal in New Zealand is not less than 60,000 tons a year, costing the colony something like £150,000. A colonial journal says:—"There is no doubt that we can supply a better coal than any imported into New Zealand, and at 25 per cent. less cost, and this with a profit sufficiently large to the holders to compete with any ordinary investment. What is wanted is a company started on a sufficiently broad basis, and we are certain, it this can be done, all the necessary capital can be raised, if not in Nelson, in the other provinces."

Demerara.—During last year some progress has been made in the cultivation of cotton, and that shipped from here has realized a good price, giving a good return to the growers. Before another twelvemonths have passed the cultivation of the leading staple is likely to be extended over the length and breadth of the colony. For some time past expeditions have from time to time been undertaken by private individuals in search of gold, but at length a favourable locality has been found, and in the latter end of October, the "British Guiana Gold Company" was formed, the capital being fixed at 75,000 dols. in 1,500 shares of 50 dols. each, all of which were taken within the time specified.

Obituary.

Lord Ashburton.—The death of the Right Hon. William Bingham, Lord Ashburton, took place on Wednesday, the 23rd of March, at his country-seat, the Grange, near Alresford, Hants. His lordship had been seriously ailing for some time from pulmonary complaints, but he was suddenly cut off by an attack of heart disease, to which he had been subject from his youth. His lordship was born in the last year of the last century, and was consequently in the 65th year of his age. He was the son of the well-known Alexander Baring, the prince of English merchants, who for so many years took a conspicuous part in the House of Commons, and was eventually raised to the peerage by Sir Robert Peel, who afterwards employed him in the negociation of the celebrated treaty which bears his name, for the adjustment of our north-eastern

boundary with the United States. The confidence which Sir Robert reposed in the father was also extended to the son, and though the deceased peer had been a member of the House of Commons from the year 1826, on coming into office on the overthrow of the Whigs in 1841, he gave the Hon. Mr. Baring the post of one of the Secretaries to the Board of Control, an office that is now represented by the Under-Secretaryship for India. He continued in this office till 1845, when he was advanced to the more lucrative if not the more important office—now abolished—of Paymaster of the Forces and Treasurer of the Navy. This post he did not hold long, however, for in the following year Sir Robert Peel introduced his bill for the repeal of the Corn Laws, a measure in which he was zealously followed by his subordinate, who went out with him at the close of that struggle. This may be said to have concluded Lord Ashburton's political career. He remained in the House of Commons for two years longer, when his father died, and he was summoned to the Upper House. When at the University he took high honours, and through life he had a warm appreciation of all that related to science and literature. The hereditary interest he took in commercial affairs was acknowledged in 1855 by the Emperor of the French, who decorated him with the rank of Commander of the Legion of Honour in commemoration of the services he had rendered to commerce. In 1860 he was elected President of the Geographical Society, a post which he resigned from ill-health sometime previous to his death. But while he occupied himself with these questions they did not divert him from a question which ever lay near his heart—the moral and social elevation of the working classes. In their cause he was a practical philanthropist, and he possessed one of the true qualities for success in that field; he had a high opinion of their capacities while he was not blind to their defects. At the dinner of the Royal Agricultural Society held at Windsor in 1851—the year of the Great Exhibition, when the Prince Consort graced the meeting with his presence—to Lord Ashburton was entrusted the toast of the agricultural labourer. On that occasion he spoke with an eloquence which surprised every one, and with a good sense which seems to be a hereditary quality of the Baring family. He lamented the limited spread of education among the rustic classes; the inability to read and write was by far too much the rule among them, but yet he would not allow that they should be called uneducated. It could not be said, he argued, that that was an uneducated man who by the trained use of his eye alone was able to drive a furrow in a line of mathematical precision from one end of a field to the other; or who, with a calculation that looked like intuition, could tell to a handful how much seed was required to be put into a given area of soil. These, he said, were qualities that were too apt to be overlooked in the rage for making reading and writing everything, and other accomplishments nothing. The same principle he developed more fully a few years afterwards, when, in order to counteract what he believed to be the injurious tendency of an exclusive devotion to mere school education, he offered a series of prizes to the scholars of our national schools for a knowledge of "common things," a step the nature of which has since been fully recognised by other educators, but of which he was the first to set the example. His lordship was twice married, but he has left only a daughter by his second wife, the daughter of the late Right Hon. James Stewart Mackenzie. He was elected a member of the Society of Arts in 1864, and was a Vice-President of the Society.

James Pillans, M.A., LL.D., &c., was born at Edinburgh in 1778, being the son of a printer there, and was educated at the High School and University of that city. He died at his house, Inverness-row, Edinburgh, the 27th March, aged eighty-six. Among his early associates and fellow-students were Henry Brougham, Francis Horner, Francis Jeffrey, and other names, which afterwards became celebrated. He also made the acquaintance of Thomas Campbell, in London, about 1797. Mr. Pillans began active life as a tutor, first in a private family, and afterwards at Eton; and in January, 1810, he became, at the suggestion of Francis Horner, a candidate for the rectorship of the High School of Edinburgh, then vacant by the death of Dr. Adam. To this office, which he filled for ten years and a half, he was elected by the Town Council. In 1820 he was unanimously chosen Professor of Humanity (Latin) in the University of Edinburgh, and filled that chair for forty three years, having retired only last year in consequence of failing strength. He last appeared in public at the meetings of the Education Section of the Social Science Congress held in Edinburgh last autumn, though then unable to take any part in the business. Throughout his long and temperate life he had scarcely ever known a day's sickness, and he only succumbed at length to the advance of years. For about fifty years his name has been widely known as an earnest and enlightened instructor of youth, and he was, in his earlier years particularly, a strenuous advocate of the cause of popular education. His career was marked both in the High School and University by great success in the cultivation of ancient literature, and particularly Latin verse. He was the author of several works, both on elementary and classical education, on ancient geography and Roman literature. As a teacher it was his boast that he had lessened the frequency of corporeal punishment in the High School, and substituted the supremacy of honour, principle, and affection for the reign of terror and the prostration of fear. He enjoyed in no common degree the regard and gratitude of his pupils, the list of whom included hundreds of the best educated and most successful of his countrymen.

Publications Issued.

The Vine and its Fruit, especially in relation to the production of wine; embracing an historical and descriptive account of the grape, its culture and treatment in all countries, ancient and modern. By James L. Denman. Crown 8vo. pp. 358, price 8s. 6d. cloth. (*Longmans.*) This work is divided into sections, the first portion being devoted to the history and early origin of the vine, its characteristics and general diffusion; the most suitable soils, and the usual mode of culture; its natural maladies and numerous enemies; its popularity and utility. Another section treats of the system and practice pursued by the ancients in the management of their vine grounds, their superlative wines and their curious treatment of them. This is followed by a minute account of the character and qualities of modern wines, illustrated by statistical facts and historical incidents. The vintages of all the principal wine countries are then separately discussed, a separate section being given to each class. The chapter on Portugal especially demands attention, as showing the artifices there resorted to for changing the natural character of its staple product, with the sophistications practised in supposed deference to English taste. The particulars connected with the Hungarian vine grounds show their almost unlimited powers of production; whilst the natural and historical facts given relative to the Grecian Archipelago will be new to most English readers. Other sections of the work furnish information respecting the more distant and tropical regions, and the work concludes with some practical remarks on the choice and preservation of wine; hints for judicious selection and cellar management; chemical analysis of alcoholic liquors; the hygienic properties of wine, and its use in the modern practice of physic. A short appendix gives the results of the Government commission of inquiry recently instituted for ascertaining the natural strengths of wine in the principal wine-growing countries of Europe, together with tables of the average strengths of the miscellaneous wines

submitted at the International Exhibition of 1862, as afterwards determined by the analytical labours of Mr. J. B. Keene, to whom the task was intrusted by government authority.

Forthcoming Publications.

The Life, Times, and Scientific Labours of the Marquis of Worcester.—*Mr. Bernard Quaritch*, of Piccadilly, is about publishing a "Life of the Marquis of Worcester," with a reprint of his "Century of Inventions," and with a commentary thereon by Mr. Henry Dircks, Civil Engineer, whose antiquarian taste will find ample scope in ilustrating both the memoir and the noble author's "Century." The work derives a further interest from its being the first attempt to arrange a complete biography of the illustrious inventor of the steam-engine in its primitive form.

Notes.

Fire Escape Ladders.—The Town Council of Tynemouth have lately had a set of scaling-ladders presented to them by Mr. George Fawcus, ship builder, of North Shields, one of their number, who is the inventor, and who now gives up his patent right to the public. The peculiarity of the invention consists in having a steel spring to fasten the ladders together, acting like the spring of an umbrella or a sword-bayonet catch. There is also a small iron half-button to keep the springs back when disconnecting the ladders, or at other times when necessary. There are two ladders eleven feet long, and two six feet long, which all join, the heads of all the ladders fitting all the feet indiscrimately. The ladders are now fitted to the fire-engine at North Shields, to which they are attached by straps and tackles, readily disconnected when required.

Spread of Education.—Boswell, in his life of Johnson, mentions a reply made by the latter to a gentleman who was maintaining that a general diffusion of knowledge among the people was a disadvantage, for it made the vulgar rise above their humble sphere. Dr. Johnson replied, "Sir, while knowledge is a distinction, those who are possessed of it will naturally rise above those who are not. Merely to read and write was a distinction at first, but we see when reading and writing have become general the common people keep their stations. And so, were higher attainments to become general, the effect would be the same."

Aromatic Trees.—A very common tree in the Ilhas do Mata is the Breio branco, which secretes from the inner bark a white resin, resembling camphor in smell and appearance. The fruit is a small black berry, and the whole tree—fruit, leaf, and stem—has the aromatic fragrance. By loosening the bark and allowing the resin to flow freely a large quantity may be collected, and the author of "The Naturalist on the Amazons" found it of great service in preserving insect collections from the attacks of ants and mites. Another tree, much rarer than the Breio branco, namely, the Umiri (*humirium floribundum*), growing in the same localities, distils in a similar way an oil of a most *recherché* fragrance. The yield, however, is very small. The native women esteem it highly as a scent. To obtain a supply of the precious liquid, large strips of bark are loosened and pieces of cotton left in soak underneath.

Workmen's Stores.—The eighteenth half-yearly report of "Price's Workmen's Stores Industrial Society, Limited," states that the result of their transactions has been very prosperous, the profits made since the last half-yearly report being £172 19s. 2d. This sum, less £19 5s. for interest, and £41 8s. 5d. for the 5 per cent. on the fixed stock account, leaves £112 5s. 8d. to be divided. In dividing this amount the committee recommend:—That a dividend of one shilling in the pound sterling be declared on members' dealings who shall be free of arrears, and sixpence in the pound sterling on non-members' dealings, and if any surplus remain it be placed to the reduction of the fixed stock account. That the interest on the members' shares and dividend on their dealings, be paid on two fixed days, between the hours of six and nine in the evening. The committee mention that nearly all the members of this Society have received more money from than they have paid to the funds of the Society, besides which their shares have considerably increased, £1 having advanced to £5 19s 6d. The amount received for goods sold during the last half-year was £3,112. The committee think that the statement of the above facts should recommend the society as a safe and profitable means of investing savings, as well as of obtaining genuine articles at the cheapest rate.

Correspondence.

The Folding Boat.—Sir,—Much has been said of late about this supposed new invention, notwithstanding that folding boats have been exhibited and experimented upon for at least the last forty years, while, by the description, this last proposal seems to be particularly crude and imperfect. It is flat-bottomed, and therefore quite unfit to live in a raging sea, and requires an enormous ballast, and it is rather surprising that the reported experiment should have been made in the face of the fact that the Rev. Mr. Berthron has for years past constructed and exhibited folding boats up to one hundred tons burden, and capable of carrying heavy ordnance. His mode of construction admits of the adoption of the finest form of body for sailing qualities. They are indestructible on rocks, can neither be sunk nor upset, require no ballast, and are, in fact, perfect life-boats. They can be lowered in their collapsed state, as they immediately expand on touching the water, and inflate the air compartments at the same time, so that the men can instantly jump into them and get off, for the oars and traps are always in them. The same gentleman has also constructed a very simple perpetual log, which has the further merit of always indicating the exact lee-way; also, a perpetual sounding lead, by means of which an accurate section of the bottom may be readily obtained. The Rev. Mr. Berthron has, of course, patented his inventions, and expended between two and three thousand pounds without the slightest prospect of any return. His first application was to the gentlemen who form the Board of Admiralty, when he was informed that the Lords considered his invention to be of a most perfect and beautiful description, but declined adopting it, as men-of-war were never permitted to take on board anything in the shape of a life-boat, because all the men would desert. They recommended him, however, to lay his invention before the commercial marine, but the reply he obtained from charterers and shipowners was, that the commercial conscience did not permit the slightest extra outlay for the mere purpose of saving human life, excepting so far as they were under the regulations of Parliament, but that if he could procure an Act to be passed they would, of course, submit, and adopt his folding boats, which they so much admired.—I am, &c., Henry W. Reveley.

Reading.

PARLIAMENTARY REPORTS.

SESSIONAL RPINTED PAPERS.

Par. Numb.

Delivered on 1st of March, 1864.

3. Bed of the Sea, &c.—Return.
10. Registers of Voters—Returns.

19. Railway and Canal, &c. Bills (121. Oswestry and Newtown and other Companies (Arrangements); 122. Pembroke and Tenby Railway; 123. Petersborough, Wisbeach, and Sutton Railway; 124. Portpatrick Railway; 125. Redruth and Falmout Junction Railway; 126. Reigate and London (West End Junction Railway; 127. Rhymney Railway (Extensions); 128. Riddlesdale Railway; Rickmansworth, Amersham, and Chesham Railway; 129. Royston and Hitchin Railway; 130. Salisbury and Yeovil Railway; Salisbury Railway and Market House Company; 131. Scottish Central Railway (Dundee and Newtyle Extension), (Stations, &c.); 132. Scottish North Eastern and Alyth Railways; Scottish North Eastern, and Perth, Almond Talley, and Methven Railways; 133. Scottish North Eastern and Scottish Central Railway; 134. Scottish North Eastern Railway; 135. Sevenoaks, Maidstone, and Tunbridge Railway; 136. Sheffield, Chesterfield, and Staffordshire Railway; 137. Shrewsbury and Welchpool Railway; 138. Somerset and Dorset Railway (Cheddar Valley and Yatton). (Extension to Shepton Mallet); 139. South Eastern Railway (Nos. 1, 2, 3, and 4); 140. South Wales Mineral Railway; 141. South Yorkshire Railway; South Yorkshire Railway and River Dun Company (Transfer, &c.); 142. Stonehouse and Nailsworth Railway; 143. Sunningdale and Cambridge Town Railway; 144. Surrey and Sussex Junction Railway; 145. Swansea Vale and Neath and Brecon Junction Railway; Swansea Vale Railway; 146. Tamar, Kit Hill, and Callington Railway; 147. Tendring Hundred Railway; Tewkesbury and Malvern Railway; 148. Tooting, Merton, and Wimbledon Extension Railway; 149. Tottenham and Hampstead Junction Railway (Alexandra Park Extensions); 150. Trent, Ancholme, and Grimsby Railway; Tunstall Railway; 151. Wallingford and Watlington Railway; 152. Watford and Edgware Junction Railway; 153. Wensum Valley Railway; 154. West Drayton and Staines Railway; 155. West Grinstead, Cuckfield, and Hayward's Heath Junction Railway; 156. West Norfolk Junction Railway; Weston super Mare, Axbridge, Cheddar, and Wells Railway; 157. West Riding and Grimsby Railway; 158. West Shropshire Mineral Railway (Branches, &c.), (New Lines); 159. West Sussex Junction Railway; 160. West Yorkshire Railway; 161. Wilts and Gloucestershire Railway; 162. Witney Railway)—Board of Trade Reports.

Delivered on 3rd March, 1864.

19. Railway and Canal, &c. Bills (174. Aberbrothwick Harbour; 175. Hubberston Docks; 176. Hull Docks; 177. Lancaster Canal Transfer; 178. Launceston, Bodmin, and Wadebridge Junction Railway; 179. Londonderry and Lough Swill Railway; 180. Newry and Armagh Railway; Newry and Armagh Railway Extension; 181. Newtown and Machynlleth and Aberystwith and Welsh Coast Railways; 182. Parsonstown and Portumna Bridge Railway; 183. Petersfield and Bishops Waltham Railway; 184. Pulborough Storrington, and Steyning Railway; 185. Severn Valley Railway; 186. Staines, Egham, and Woking Junction Railway; Stamford and Essendine Railway; 187. Torbay and Brixham Railway; 188. Wellington and Drayton Railway; 189. Wolverhampton and Bridgnorth Railway)—Board of Trade Reports.
80. Coal—Return.
87. Railway Schemes (Metropolis)—Report.
Denmark and Germany (No. 4)—Correspondence respecting Holstein, Lauenburg, and Schleswig.

Delivered on 4th March, 1864.

12. Deaths—Return.
55. (1). Railway and Canal Bills—Second Report from General Committee.
77. Reigate Borough—Return.
92. Police (Ireland)—Return.
95. Army—Supplemental Estimate for 1863-4.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Entomological, 7.
Medical, $8\frac{1}{2}$.
British Architects, 8.
Royal Inst., 2. General Monthly Meeting.
Tues. ...Civil Engineers, 8. Renewed Discussion upon Mr. Phipps's Paper, "On the Resistances to Bodies passing through Water."
Pathological, 8.
Photographic, 8.
Anthropological, 8.
Royal Inst., 3. Prof. Helmholtz, F.R.S., "On the Natural Law of the Conservation of Energy."
Wed. ...Society of Arts, 8. Mr. Thomas Purdie, "On the Principle of Imitation as applied to the Decorative Arts."
Pharmaceutical, 8.
Thur. ...Society of Arts, 8. Cantor Lectures. Dr. F. Crace Calvert, "On Chemistry applied to the Arts—Gelatine, Glue, &c.
Royal, $8\frac{1}{2}$.
Antiquaries, 8.
Linnæan, 8. Mr. Daniel Hanbury, "On the *Garcinia* yielding Gamboge in Siam."
Chemical, 8.
R. Society Club, 6.
Royal Inst., 3. Prof. Helmholtz, F.R.S., "On the Natural Law of Conservation of Energy."
Fri. ......Astronomical, 8.
Royal Inst., 8. Dr. John Percy, F.R.S., "On Iron."
Sat ......R. Botanic, $3\frac{3}{4}$.
Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

Patents.

From Commissioners of Patents Journal, March 25th.

Grants of Provisional Protection.

Baking oatcake—532—J. Wright.
Baryta and strontia, production of—580—W. E. Newton.
Boat-detaching apparatus—468—W. M. Van Wagenen.
Bottles, closing or stoppering—588—F. Spiers and C. Pond.
Bottles, jars, &c., apparatus for stopping—594—N. Thompson.
Brick-moulding machine—473—A. Jullienne and J. E. de la Combe.
Casting metals—556—H. Cochrane.
Cloth—560—R. A. Brooman.
Collisions on railways, apparatus for preventing—569—J. Price and R. E. Donavan.
Corn-reaping machinery—564—J. Backhouse.
Drying grain—578—J. H. Johnson.
Dyeing textile fabrics—584—J. P. Worrall.
Excrementitious matter, drying—592—E. Bishop and W. Bailey.
Fire-arms and cannon, breech-loading—469—B. Burton.
Garden rollers—529—G. H. Ellis.
Glass-polishing—538—E. Hall.
Gunpowder, manufacture of—292—H. E. Drayson.
Hydraulic power—586—G. Davies.
Lamps, paraffin, &c.—470—T. Rowatt, jun., and A. Lighbody.
Looms—548—F. Lepoutre.
Manure—595—J. L. Norton.
Metallic coating of metals—497—F. Weil.
Millinery trimmings, machinery for manufacturing—506—C. G. Hill.
Needles for sewing machines—596—W. E. Broderick and W. Rees.
Oil-cans and lamps—566—J. Revell.
Packing cases—402—J. A. Lloyd.
Paper manufacture—542—W. Ibotson.
Photography—503—J. W. Swan.
Puddling furnaces—315—W. Taylor, W. Molineux, and H. Harrison.
Rollers for spinning machinery—598—G. T. Bousfield.
Sack-holder—546—J. Spencer.
Ships, apparatus for propelling—550—M. Henry.
Signal apparatus for steam-boilers—574—J. Lawrence.
Sizing cotton and other threads—531—W. Wilkinson.
Sofa or transformable bed—576—E. Cowles.
Spring tension regulator—600—G. Haseltine.
Steam engines—590—W. Hutchinson.
Sugar, glucose—552—A. Manbre.
Sugar manufacture—519—W. Miller.
Sugar-refining—568—W. E. Newton.
Thread-winding apparatus—536—J. Crutchett.
Utilizing refuse tinned iron, &c.—534—W. Clark.
Vulcanising india-rubber—562—C. Humphrey.
Washing blues—582—F. Tolhausen.
Weaving—558—W. Milligan and B. Duty.
Wood-boring machine—487—T. C. Barraclough.

Inventions with Complete Specification Filed.

Circular sawing machines—709—A. B. Childs.
Yeast presses—701—J. B. Jude.

Patents Sealed.

2376. T. Lowe.	2393. J. J. Chidley.
2383. J. Bailey, G. W. Blake, and W. H. Bailey.	2398. G. Elliot.
2386. F. G. Mulholland.	2399. B. Browne.
2387. S. Mendel.	2408. G. Dickey.
2391. J. Cooper.	3189. J. Astbury.

From Commissioners of Patents Journal, March 29th.

Patents on which the Stamp Duty of £50 has been Paid.

718. T. S. Truss.	780. G. M. Coppo.
719. J. Victor and J. Polglase.	741. P. R. Hodge.
729. A. Haley.	749. W. Brookes.
738. T. Cardwell and D. Campbell.	769. J. G. Willans.
	788. W. D. Napier.
759. T. Davison and R. Paterson.	1039. S. Fox.
716. W. I. Cranston.	1153. J. Willis.
773. P. M. Parsons.	778. W. Sorrell.
851. B. Knowles.	817. W. Clark.
753. J. Chatterton & W. Smith.	

Patents on which the Stamp Duty of £100 has been Paid.

834. R. Sims.	838. R. Cassels and T. Morton.
827. W. H. Collins.	863. W. Ross.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, APRIL 8, 1864. [No. 594. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

APRIL 13.—"On a New Process of Preserving Meat." By Dr. MORGAN, Professor in the Royal College of Surgeons, Ireland.

APRIL 20.—"On the Patent Laws." By THOMAS WEBSTER, Esq., F.R.S.

CANTOR LECTURES.

The next lecture on "Chemistry applied to the Arts" will be delivered by Dr. F. CRACE CALVERT, F.R.S., F.C.S., corresponding member of the Royal Academy of Turin, of the Société Industrielle de Mulhouse, of the Société Imperiale de Pharmacie de Paris, &c., on Thursday evening, at 8 o'clock, as follows:—

APRIL 14.—LECTURE III.—LEATHER.—The art of the currier. Morocco, Russia, and patent leathers. The art of tawing skins. Chamois and glove skins. Parchment. *Hair*, its composition and dyeing. *Wool*, its washing, scouring, bleaching, and dyeing. *Silk*, its adulterations and conditioning.

APRIL 21.—LECTURE IV.—ANIMAL FATTY MATTERS, the various processes for liberating them from the tissues in which they are contained. Their composition and conversion into soap. Composite candles. The refining of lard. *Cod-liver*, *sperm*, and other oils. *Spermaceti* and *wax*.

APRIL 28.—LECTURE V.—FLESH, its chief constituents, boiling, roasting, and preservation. *Animal black*, its manufacture and applications. The employment of animal refuse in the manufacture of *prussiate of potash*. *Prussian blue*. Manufacture of artificial animal manures.

MAY 5.—LECTURE VI.—ANIMAL LIQUIDS.—*Bile*, its purification and detergent properties. *Blood*, its application in the refining of sugar and the manufacture of albumen. *Albumen*, its use in calico printing and photography. *Urine*, its uses. *Milk*, its composition properties, falsification, and preservation. A few words on putrefaction.

INSTITUTIONS.

The following Institution has been received into Union since the last announcement:—

Clay Cross Institute and Public Hall.

The Lady-day subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

CANTOR LECTURES.

The first two lectures of Dr. Crace Calvert's Course "On Chemistry Applied to the Arts," were delivered on Thursday evenings the 31st March and 7th April. A full report of this course of lectures will appear in the *Journal* at a future time.

SIXTEENTH ORDINARY MEETING.

Wednesday, April 6th, 1864; William Hawes, Esq., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Bourne, Stephen, Examiner's-office, H.M. Customs, E.C.
Croskey, Joseph Rodney, Warwick-house, Maida-hill, W.
Lawson, Archibald Scott, 1, John-street, Bedford-row, W.C.

AND AS HONORARY CORRESPONDING MEMBERS.

Lancia di Brolo, Le Duc, Palermo.
Venturini, Le Commandeur Charles, Ancona.

The following candidates were balloted for and duly elected members of the Society:—

Nelson, Thomas James, Guildhall, E.C.
Parsey, Samuel, 77½, Little Britain, E.C.
Stanford, Edward C. C., 63, Lincoln's-inn-fields, W.C.

AND AS HONORARY CORRESPONDING MEMBER.

Romako, Joseph, Admiralty, Trieste.

The Paper read was—

ON THE PRINCIPLE OF IMITATION AS APPLIED TO THE DECORATIVE ARTS.

BY THOMAS PURDIE, ESQ.

The reaction which, within the last thirty years, has set in and run with so strong a current in favour of mediæval architecture has been accompanied by a taste for a similar style in furniture and decoration, in painting and in the forms of worship. The question of rituals is altogether foreign to our province. Nor is it my purpose, in the remarks which I have to bring before the Society of Arts, to discuss the relative merits of Classic and Gothic architecture, of post or pre-Raphaellitism in painting. It seems to me that no man can be a faithful apostle, or even a true loving disciple of art, until he has become truly catholic in his taste and tolerant in his practice; until he has seen the vision of the sheet descending from above, and is prepared to find beauty as well as pleasure in every style of art which has exercised the taste, the skill, and the ingenuity of man. But as the waves raised by this eruption of mediævalism into our times have flowed in ever-widening

circles, over the feelings of the age, they have left their impress on objects which, *à priori*, no one could have expected they would reach. In the discussions which of late years have been carried on, on the subject of art, language has been perverted from its original meaning, ethics and æsthetics have been jumbled together, bad taste has become confounded with moral turpitude, stucco, when employed to decorate the exterior of a building, is denounced as an unprincipled sham; an ornamental casting as a falsehood, because it may resemble a carving; a composition or painted imitation of a wood or a marble, as a downright and inexcusable lie.

It is my object, by a candid examination of the subject, to try to educe some principle,—to ascertain in what cases ornamental castings and composition or painted imitations of material may be employed, without infringing the laws of propriety or good taste; or whether the use of such appliances belongs to the same category and is to be subjected to the condemnation generally awarded to such practices as the wearing of false jewellery, or the restoring by means of rouge the tints of the rose to the cheek of the faded beauty.

As the text of the present discussion, and as representing that view of the question from which, after a full and I trust a fair consideration, I venture to differ, I shall quote one or two passages from a celebrated author, who is generally considered one of the soundest art-critics of the day. Between the principles of mediævalism and the practice of those imitative arts which shall come under our notice there is no absolute or necessary antagonism. I trust therefore, it may not be supposed that in supporting the one I must be held as condemning the other. In urging the toleration of certain decorative appliances, I yield to no one in admiration of the glorious structures of the middle ages, in which our forefathers have left,—in a fossil form, for the study of the geologists of history,—a record of the taste, the spirit of self-sacrifice, and the religious sentiments of the age in which they lived. Indeed, it will be found that I shall arrive, in numerous instances, at the same practical conclusions with my opponents, although we may have taken different roads to get there.

Touching the false representation of material, says the talented author referred to, in one of the eloquent denunciations for which he is famous, "The question is infinitely more simple and the law more sweeping; all such imitations are utterly base and inadmissible. It is melancholy to think of the time and expense lost in marbling the shop-fronts of London alone, and of the waste of our resources in absolute vanities, in things about which no mortal cares, by which no eye is ever arrested, unless painfully, and which do not add one whit to comfort, or cleanliness, or even to that great object of commercial art—conspicuousness. But in architecture of a higher rank, how much more is it to be condemned. I may perhaps be permitted," he continues, "while I express my sincere admiration of the very noble entrance and general architecture of the British Museum, to express also my regret that the noble granite foundation of the staircase should be mocked at its landing by an imitation, the more blameable because tolerably successful. The only effect of it is to cast a suspicion upon the true stones below, and upon every bit of granite afterwards encountered."

And again, at another part of the same book:—

"The worth of a diamond is simply the understanding of the time it must take to look for it before it is found. Exactly as a woman of feeling would not wear false jewels, so would a builder of honour disdain false ornaments. The using of them is just as downright and inexcusable a lie. You use that which pretends to a worth which it has not; which pretends to have cost, and to be, what it did not, and is not—it is an imposition, a vulgarity, an impertinence, and a sin. Down with it to the ground, grind it to powder, leave its ragged place upon the wall rather; you have not paid for it, you have no business with it, you do not want it. Nobody wants ornaments in this world, but everybody wants integrity. All the fair devices that ever were fancied are not worth a lie. Leave your walls as bare as a planed board, or build them of baked mud and chopped straw, if need be, but do not rough cast them with falsehood."

I cannot agree with those who think there is no force in these arguments. They seem at first sight not a little convincing; and, coming to us with the sanction of a great name, they would have been worthy of our best attention, although they had been possessed of no other claims. But I believe that they are fallacious notwithstanding.

It will be observed that the sin is held to lie in the deception. I shall not be suspected of an intention to argue that there is no harm in a moral deception, but it may perhaps be asked on what authority the principles of ethics are in this case applied to æsthetics. The principles of ethics are founded (leaving revelation out of view) on the primary convictions of mankind, and I may assume that no one will commit the absurdity of claiming for æsthetics a higher authority. The very fact, then, that these imitations are so generally used and so much admired among an educated and a moral people, certainly affords the strongest possible presumption in their favour. As these primary convictions mainly lead men in the paths of morality, it is surely a sound conclusion that they cannot lead us far or permanently wrong, where any essential principle is involved, in matters of taste. But we shall pass from this point, and ascertain, as careful judges ought to do, on what side the best precedents can be quoted.

Now it is not unusual in disputed questions of taste—which means of course in all questions of taste—to appeal to the authority of the ancient Greeks, as the court of last resort, and I should be sorry to depart from a custom which, if not yet venerable from its antiquity, had at least the merit of being the fashion, until the taste for mediævalism to some extent supplanted that for classic art. In appealing to them we may congratulate ourselves, and perhaps the ancient Greeks too, that they do not live in modern times, for one of two things must have been the result of such a misfortune;—either we should have wanted that authoritative tribunal — the wisdom of our ancestors—before which we could bring our cases for ultimate decision, or they, the ancient Greeks, must have had an accumulation of suits which would have left the Court of Chancery altogether destitute of a reputation.

Did the Greeks then allow the principle of deception in art?

It is recorded of Zeuxis, one of the greatest painters of ancient times, that the birds came and pecked at the fruit on his canvass, while one of his rivals asserted that the boy who held the basket could not be equally well painted, else the birds would have been frightened away; of Apelles, that he painted horses so truthfully that animals of their own species greeted them by neighing. Whether these stories be more worthy of belief than that of Arion and his Dolphins, we know not, but the fact of their being related, sufficiently proves that the wonderful people whose support we claim were not less alive to the power of painting than of music, and that the deceptive character of the former was reckoned one of its chief merits. In a trial of skill between Zeuxis and Parrhasius, the victory was adjudged to the latter, when his opponent, entering his studio, desired him to withdraw the curtain behind which he supposed his rival picture was concealed, the curtain itself being the picture; and Zeuxis gracefully acknowledged his defeat, saying his own picture had merely deceived birds, while the other had deceived men.

But we can appeal to an authority which many will regard with greater veneration than that of the ancient Greeks. Ornamental castings in bronze, iron, and other materials were universally employed during the middle ages, while the first use made of oil painting after its

discovery in the early ages of the Christian era was to paint imitations of marble.

The work of Heraclius, a compendium of the arts as practised previous to his time, is supposed to have been written in the seventh century. In it we find elaborate instructions for preparing the surface of columns, and painting them in imitation of marbles, as if, too, this were the only artistic use to which the oil vehicle could be applied. In fact, precedents of all ages may be adduced to sanction the practice which our modern authors condemn. But it is not enough that we produce strong presumptive evidence, however conclusive that may be, in support of our views. Nor is it enough that we can appeal in their support to the practice at once of ancient and modern times. We must also show that they are just in themselves or that they rest on right principles. This we propose to do by the following method:—

1st. We shall shortly advert to that love of imitation in which the fine arts have their origin.

2nd. We shall state some cases in which deceptive imitations are admissible, as contrasted with those of a different class.

3rd. We shall name the qualities which give value to decorative appliances, and illustrate the subject by showing how far some of these fulfil the conditions required of them.

4th. We shall conclude by pointing out and illustrating the conditions which ought to regulate the use of surface coatings.

First, then, as to that love of imitation which lies at the root of the fine arts. All decorative art may be divided into three kinds with reference to its subjects, or the mode in which they are treated.

1st. The geometrical.

2nd. The conventional.

3rd. The purely imitative.

Examples of the first-class are to be found connected with every style of architecture. Almost all moresque ornamention is geometrical, and the Greek fret may be named as affording an example of the style.

The second-class, or conventional, takes its place midway between the other two. It is imitative after a fashion, through which—although natural forms are not directly imitated—the spirit of the form imitated is retained, as a melody in music, in the variations which are composed upon it. The most perfect examples of conventional ornament are, perhaps, the lotus of the Egyptians, and the honeysuckle of the Greeks. All architectural ornament may be said to be either geometrical or conventional, or a combination of the two.

The third, or purely imitative art, includes the painting of the human figure, of landscape, fruit, flowers, and all cases in which a direct representation of the object is attempted.

We cannot afford time to treat this subject fully, nor have we anything to do in the present discussion with geometrical or conventional ornamentation. Our attention will be restricted to the third class which we have named, as it is only in the exercise of purely imitative art that the questions now proposed for discussion can arise.

To make a great artist, the head, the heart, and the hands must combine. He must be possessed of the three great qualities which give power over the imagination, the emotions, and the understanding. He must be possessed, first, of imagination or fancy, the power which creates, invents, or suggests, which is common to the painter, the poet, and the sculptor. Second. He must possess a sympathetic nature—that power of sympathy which teaches the heart to vibrate in unison with the true, the beautiful and the good. In simpler language, he must be possessed of taste, which has been well styled the science of the emotions, a faculty which—according as it is considered passive or active in its nature—signifies on the one hand susceptibility to the emotion, on the other, the knowledge intuitive or acquired, of those qualities in external things which are fitted to excite it in others. Third. He must possess technical knowledge and skill to enable him to express by means of form and colour the ideas which the mind has conceived. Now these three qualities of imagination or fancy, taste, and executive skill, must be found, less or more, in every work of art. Not equally.

It is only in the highest rank of art, where human life is the subject and human form the mode of expression, that the highest faculties of the artist are called into exercise. This rank is the highest, for the simple and obvious reason that it does so employ these powers that it deals with the noblest subjects, and addresses itself to the most profound emotions of the human mind. It is in the field which these faculties open to us that art must operate if it is to assist in the great work of cultivating the intellectual powers or the moral sentiments, and in reaping the rich fruit they are calculated to bear.

But at the root of all art lies the love of imitation. To this feeling the fine arts owe their existence. Without some notice of it, therefore, it seems, no theory of the fine arts could be perfect. This love of imitation, or of representing objects by their images, whether exemplified in the tendency to imitate or in appreciating works of imitative art, is, no doubt, an original powerful sentiment or instinct of our minds. We love imitation for its own sake—not only as a means but as an end. Apart from and beyond the pleasure which we receive from such an object, for example, as a portrait, in recalling the features of the "distant or the dead, the loved or the lost," there is a pleasure in observing the resemblance between the original object and its image; a pleasure which may be traced to the same source, whether it be found in poetical imagery, in a dramatic representation, in a picture, a statue, or a simple imitation of marble.

But this love of imitation is not always associated with the highest qualities of the mind. It may be indulged in numerous instances where no original idea is expressed, or where that idea is to be found in the subject of the imitation. All such examples employ the mechanical more than the intellectual powers, and cannot therefore rank so high as works of art. They do not suggest great thoughts, but they may possess great beauty, and they may yield a rational pleasure in suggesting interesting relations between the imitation and the thing imitated.

Now, this imitation in the fine arts must be distinguished from reproduction, as well as from imitation effected either by organic or mechanical means. One receives no impression of beauty from the resemblance which the apples on a tree bear to each other. Nor would he be struck by seeing a table with a vase on it reproduced by another table and another vase. But let a painter produce these objects on his canvass, they would receive a new virtue, which, to use a popular phrase, would attract and please the eye. Where the deception is complete the pleasure is gone, because there is no image—nothing to judge of—nothing to compare.*

Having thus indicated what imitation in the fine arts means, we come, as proposed under our second head, to state some cases in which deceptive imitations are admissible as contrasted with others which belong to a different class.

But I must first explain that when, in the course of this discussion, I employ the terms deceptive or deception, they must be understood in a qualified, not an absolute, sense. Where an object is an actual deception, it can obviously afford no pleasure as a work of art, although it may give pleasure from its intrinsic beauty. Suggestion, not deception, is the object even of that art which is purely imitative. Some objects, however, admit of, or demand, more perfect imitation than others.

We purpose now to test, by a few illustrations, how far we are justified in making these imitations actually

* See "Essai sur l'Imitation dans les Beaux Arts." By Quatremère de Quincy.

deceptive in their character, or so deceptive as to produce an illusion.

Such deceptions in that highest art which adopts human life for its subject, can scarcely be said to be possible, and so far as possible would, if practised, meet with universal reprobation. The technical and merely imitative elements would be found to obtrude themselves offensively in works where they ought to be kept in a subordinate position. But there are other and more palpable reasons for our dislike. You cannot certainly imitate a living, breathing, sentient being so as to deceive permanently, but you may succeed in producing a momentary illusion. You may model a figure in wax to imitate, with tolerable exactness, the human form and features. You may colour the skin. You may cover the lay figure with clothes. The finely-moulded contour may charm for an instant, under the belief that you look at real flesh and blood. You approach—you touch—the spell is broken—" you start, for soul is wanting there." It is a corpse—a coloured piece of corruption. This is no subject for a vulgar deceptive imitation truly. The nearer the approach made to the reality in such instances, the more offensive. Our dislike to such objects is founded on the same principle of our nature which makes us consider the ape as the ugliest of animals, because it most resembles man. The wax figure is too like life, for it only awakens a painful sense of its absence.

The general condemnation awarded to coloured statuary, although partly due to habit and fashion, may be attributed to the feeling called forth by the test which we supply. A deceptive imitation should not be attempted where, from the nature of the thing, or the impurity of the material, it cannot be rendered perfect. I may mention, as examples of this principle, the coloured friezes in the Greek court of the Crystal Palace; the coloured carved Madonnas one meets in all Roman Catholic countries, with which few of our countrymen will be found to sympathise. I can hardly exclude from the catalogue the tinted statuary shown at Kensington in the late exhibition. Of course no attempt was made with these statues to imitate nature, but what was done, if not a step in that direction, seemed to reduce the marble to the level of wax. No doubt there are other reasons for the feeling which we assume to exist, of which two may be stated. 1st. The colouring of statuary is an application to one art of the resources which properly belong to another; and 2nd, Sculpture has held the highest place in art because it appeals to intellect alone and not to the senses. The colouring of statuary, by introducing a sensual element, at once degrades it from its high position. We not merely tolerate, but admire statuettes in china coloured to the life with tolerable exactness. These, however, cannot produce an illusion, so there is no chance of their creating the feeling of disgust engendered by wax figures.

But this disgust and annoyance at the disappearance of an illusion are not always felt, even where the human figure is concerned.

Did any one ever feel disappointed at discovering the figures on the ceiling of the Parisian Bourse to be paintings merely? Did any one ever experience other feelings than those of admiration at the inventive talent displayed in those designs, the marvellous imitative power and command of the materials of art which could produce such works. The means in this case are equal to the end. These pictures are, however, imitations, not of men, but of sculpture, and as such successful. Great as designs, and executed with such exquisite skill as to fulfil all the conditions required of the material which they are intended to represent.

Such works as these, the numerous painted *bassi rilievi* and other similar works in the Louvre and elsewhere, the paintings of De Witt and his followers, receive from the world generally, notwithstanding the denunciations under which they labour in common with all deceptive imitations, the meed of approbation which they so fully deserve.

How stands the case as to landscape? Framed pictures we may pass over as affording no illustration of our subject. It would be a rare talent which would enable one to paint a landscape so as actually to produce an illusion when placed within a few yards of the spectator. But no illusions are more perfect than those of the scene painter. Are panoramic painted views, such as those of London, as seen from the top of St. Paul's, or of Paris, as seen from the Pantheon, to be forbidden delights in order to satisfy the requirements of this new theory, because possibly the spectator may have difficulty in persuading himself that he is looking on a flat surface? I have seen, as every one may have seen who has visited sunny Italy, what might have been a dismal court-yard changed into a paradise by the skill of the painter. In the foreground, instead of a blank dreary wall, wood and water and green fields. In the distance a picturesque range of mountains, with the sunlight striking through the gorges and tipping the far-off summits with its golden radiance. But who, on walking towards those mountains and finding they were merely painted on the boundary wall, not fifty yards distant, the wall itself being built so as to form their rugged silhouette, experienced other emotion than that of pleased surprise at the skill which could produce so marvellous an effect by means of painting. And are we to be told that all such art is base and inadmissible. " What! because thou art virtuous shall there be no more cakes and ale, and shall not ginger be hot in the mouth." Must the pent-up denizens of our cities be compelled to gaze on a blank dreary gable or into a dismal court, when he has a desire to look on brighter and more lively things, or to dwell among the horrors of Erebus, when the painter's brush, like the wand of a magician, may transform the scene into the Elysian fields?

Now I know it will be asserted that such art as I describe is not high art. Let me admit the truth of the assertion. I have already said that art is great only as it employs the intellectual faculties. The laws of perspective are now well known, and the application of them is so far mechanical. But all men are not Wilkies, nor Paul de la Roches, nor Turners, nor Roberts, luckily, or else we should have everybody producing works of high art, with nobody to buy them. It is to be feared that in such circumstances the only employment for an artist would be akin to that of Vishnu—the contemplation of his own perfections, an occupation, profitable it may be, for gods in whom humility is no virtue, who neither eat nor wear clothes, nor beget children, but not for men who do all three, and who, to be estimable, must be humble withal.

But no reasonable man would deny to an artist the right of exercising, for his own profit, and for the pleasure of his fellow-men, such talents as God has given him, merely because they are not so transcendant as those of the great masters we have named.

The fact is, as I have already indicated, this crusade against deceptive imitations, though neither essentially pre-Raphaellite nor mediæval in its character, is a phase of the fashion which has exhibited itself, and is running its course in architecture, painting, and religion. Strange practical paradoxes into which theorists are sometimes dragged, into what adhesive and traitorous quagmires of delusion and absurdity are men frequently carried when they take to ride stiff-necked hobbies. I have seen pictures of the pre-Raphaellite school in which the imitation was carried so far as to be startlingly deceptive. An imitation of what? Literally of withered leaves and straws, painted with a greater amount of care and finish than had been bestowed, in the same picture, on the human face divine, *so* startlingly deceptive that it seemed as if the straw had been packed in between the glass which covered the picture and the panel on which it was painted. Yet men who denounce all imitations as sinful, who cannot find terms sufficiently strong in which to condemn the man who spends his time and gains his livelihood by imitating the delicate veining or the rich and varied colouring of a marble, exhaust the

English language for words to sound the praises of a school which admits of such puerilities.

But deception is allowed in many cases besides painting. What is that which forms the charm of novel-writing but its deceptive character? It would be a new style of objecttion to Robinson Crusoe, that no one could read the book without feeling persuaded that it narrated facts, or to Sir Walter Scott's delineations of Baillie Nicol Jarvie and Dominie Sampson, that through their verisimilitude, they, the creatures of an imaginative brain, had taken their place as historical personages. What is the source of the delight we take in dramatic representations? Among all the objections which have been urged against the stage, did any one ever hear it asserted that actors in their professional capacity are deceitful above all men, and desperately wicked? Could it be said that Macready was an unprincipled scoundrel, because no one could see him perform without believing him to be animated by the passions which his words expressed? Over and above the interest of a drama which, although badly performed, may to some extent sway the feelings, the deceptive character of its representation forms its chief interest, and in its appeal to the imagination constitutes the performance a work of art. We admire the acting of a man who personifies a passion, while we might disregard or despise one actually under its influence.

What would Carlyle say if arraigned before the bar of public opinion for the form which some of his great works have taken? If he were charged with imposing on the public the belief that his Sartor Resartus was founded on a volume he had received of Professor Teufelsdröckh, from the press of Stillsweigen und Geschellschaft, of the town of Weissnichtwo; if it were stated in aggravation of his crime that he was an old offender; that the effect of the deception which in this case he had practised—to use the identical words employed in denouncing that class of imitations which we are now engaged in defending—was to cast a suspicion on the existence of his Abbot Sampson and the genuine Chronica Jocelini de Brokelonda, and on every bit of genuine history afterwards encountered. Do not let it be supposed that these cases are irrelevant. They are truly in point, and they are fair illustrations. The sin which is denounced is the so-called deception, common to them all, and the consideration of it as exemplified in such cases may prepare us for its admission in those others which are to come more immediately under our consideration. It must be observed that these dramatic representations and these works of fiction, like painted marbles, deceive only those who have not knowledge or penetration enough to detect the imposition. In this case, if the deception be the crime, the balance of argument, according to the views of our opponents, is in our favour. The painting contains internal evidence to reveal its true nature, while the real character of the acting, or of such writing as that in which Carlyle indulges, must be ascertained from certain conventionalities known only to the initiated, or from extraneous sources.

Immediately we shall come to some cases where the deception is not so admissible. But before doing so let us take an example from the highest and noblest of all the fine arts—that art which appeals not merely to our business and our bosoms, but to that region of man's nature which forms the seat of his most exquisite delights—the stomach. It has been well remarked of gastronomy and astronomy that the former is the more noble science, that a philosophic cook who discovers a new dish is a greater benefactor of his species than a man who discovers a new star, because we have more stars than we can ever make use of, while it is impossible ever to have too great variety of dishes. We require, therefore, no apology for drawing an illustration from so noble a science.

Let us suppose that Goldsmith's country parson, "passing rich on forty pounds a year," from the produce of his garden to manufacture an effervescing beverage and dignify it with the name of champagne. I apprehend he would not be guilty of a sin either against morality or good taste, in partaking of it himself, or in sharing it with his friends, if it pleased their palates. But woe to the nobleman or wealthy merchant who should attempt to palm such an article on his guests. They would receive it as a villanous compound, suspect their host of poisonous designs, and take care to have "unfortunately contracted a previous engagement" on all future occasions when they received his invitations. Mock turtle, though utterly destitute of the dignity which appertains to the original dainty whose noble name it bears, and in fact, without aristocratic pretensions of any kind, and it may be even somewhat plebeian and vulgar in its origin and connections, is not yet wholly proscribed, and may be met with occasionally in respectable society. But let any one conceive, if he can, the position which a Lord Mayor would occupy, who, to save the contents of his purse or the digestive organs of his guests, should supply the sham instead of the real article at his inauguration banquet.

There is here, however, not a question of sin or no sin, but of consistency or inconsistency, of propriety or impropriety. In furnishing an imitation, instead of the genuine article, there is, in the case I have supposed, no intention of deceiving any body. The original delicacies are used for certain good or pleasing qualities they possess; the same good qualities you simply reproduce in the imitation, for good qualities are real things and cannot be imitated. It is even so with imitations of materials, for the same or similar motives exist for using them.

What, then, is the conclusion of the whole matter? The sin or offence, where it exists, is ever to be found in the motive. Thus the host who passes off his gooseberry and mock turtle as genuine; the novelist and essayist who writes with the actual design of falsifying history; the citizen who paints his garden-wall to make believe that he is proprietor of a vast demesne; the householder who decorates his halls in painted marbles to impose on his friends and acquire a cheap dignity, is guilty of telling or acting a lie. But everyone knows that such cases do not exist. In dramatic representation, in works of fiction, in all examples of imitative art, although the intention is not to deceive, the deceptive nature of the representation forms a legitimate appeal to the imagination. In imitations of favourite dishes, prepared to please the palate, and in imitations of materials to please the eye, the one class is used on account of their beauty, the other on account of certain good qualities which render them desirable. In this view neither can be considered deceptive, nor even imitative, for the beauty of the one class of object and the good qualities of the other are undeniable realities.

We have thus considered a few cases in which the deceptive character of the objects seems to be unobjectionable. But when we come to discuss the question of false jewellery we find that it stands on altogether a different footing.

Precious stones are worn not for their beauty alone. If they were so, then the false would serve the purpose equally well, and no stigma would attach to their use, for they are quite as beautiful as the real, and, indeed, it is difficult to tell the difference between the two, for even connoisseurs are apt to be deceived in such matters.

Gems are worn on account of the dignity they confer as objects of cost. Hence the counterfeit meet with condemnation from all persons of education and refinement. A woman who wears false jewels intends that they should pass for that which they are not. She is a pretender to a rank and position to which she has no claim. She is guilty of a vulgarity—an impertinence—a sin if you will—from which everyone with sense and propriety would instinctively shrink.

There is a palpable fallacy contained in an argument which places in the same category imitations of objects which are used solely or chiefly on account of their beauty, and those which are used solely or chiefly on account of their suggesting ideas of cost. A fancy wood

or marble is an example of the former—a precious stone, of the latter. You may deceive by making an article which possesses little real value resemble a costly one, but to speak of deceiving as to beauty is a simple absurdity. The appearance of cost and value may exist without the reality—the appearance of beauty and the reality are one and the same thing.

Such a thesis as that which we have been disputing could not be maintained consistently throughout, so we find it stultified by the admissions of its author. "Gilding," he says, "has become, from its frequent use, innocent. It is understood," he says, "for a film merely, and therefore is allowable to any extent." I cannot admit the abstract justice of the doctrine contained in this passage, for it would go far towards justifying any practice, however absurd, which might happen to have the sanction of antiquity, and it is certainly altogether at variance with the principle on which imitations are condemned by the same author. According to this doctrine, gilding must at one time have been wrong. But that which is originally wrong can never be made right by repetition. On the contrary, it is common to hold that what is here advanced as a palliation can only serve as an aggravation of the offence.

It is hoped that we have already found sufficient justification for using imitations of materials, such as fine woods and marbles, in all legitimate situations; but this passage, if we could avail ourselves of it, and if justification were needed, would afford all that could be desired, for the use of these imitations has been for a long period so common, that however deceptive they may be, they will seldom, if ever, pass for aught else than what they are.

These remarks on gilding betray a total misconception as to what decoration really is. Decoration is a thing of surface not of construction, although the construction will frequently indicate what the decoration ought to be. You have no more reason to suppose that a thing is solid gold because it is gilded on the surface, than to suppose that a lady is silk because her outer garment is composed of that material, or that you would find the downy surface or the delicate tints of the peach at whatever point you might intersect it. The apology, therefore, tendered for gilding is not only superfluous, but of a character which could not have been accepted had an apology been necessary.

This brings us to point out, as we proposed to do under the third division of our subject, the qualities which give their value to decorative appliances. These, which we name in the order of their importance, are—

1st. Beauty.
2nd. Durability, and
3rd. Costliness.

We have just been speaking of gilding. For its employment we require no other apology than the possession of the above-named qualities, and in this respect it stands on precisely the same footing with almost all other decorative appliances, cement or plaster, metallic coatings of bronze, silver, or gold, paint, silk, veneers in wood, marble, or free-stone. Our principle is of universal application. A lady makes the dress which is to be seen of silk, her under garments of a cheaper and less showy material. You veneer a plain, inexpensive wood with one of a richer hue and of a more expensive quality. You coat you brick or rubble walls with cement, with paint, with ashlar stone, or with marble. They are understood to be mere coatings, thicker or thinner as the case may be. Zinc is coated with bronze, bronze with silver, and silver with gold, and in doing this we simply follow a natural instinct, and the example which nature herself has given us.

We shall now try how far stucco and scagliola, or painted imitations of marbles, possess these three qualities of beauty, durability, and expression of cost.

First, as to stucco. It seems to be felt necessary that some expedient should be adopted for adorning the unsightly brick buildings of which such a town as London is chiefly composed. This is effected by the material under discussion, either by an entire coating, or by means of projecting facings, thus adding force to the outlines and principal features, and contributing to the composition, those elements of light and shade so essential to the beauty of architecture, and in which brick buildings are generally so deficient. It certainly is not the fault of bricks that they are not ornamental, seeing they can produce such buildings as the Ospidale Maggiore of Milan, the Certosa of Pavia, or even such examples of street architecture, as those recently erected in Cheapside, which are now daily arising around us. But the ornamental bricks, or terra cotta, used in the construction of these buildings, being simply moulded as is the stucco or cement, are liable to precisely the same condemnation. Brick architecture of such a character would leave nothing to be desired, but it is to be feared the expense will interfere with its general adoption. The expedient usually resorted to for getting rid of the dull uniformity and flatness of brick erections, that of bands, lozenges, and squares of various colours, seems to me as barbarous as the tattooing of the savage and of precisely the same nature. The lines and forms seem to destroy the contour of the building by substituting stronger markings than those which are presented by the solids and vacuities, they withdraw attention from the principle architectural features—from the form and outline of the building which give it character and expression, and in which, as in a face, the beauty ought chiefly to be found.

Stucco, then, supplies a want—in cases where stone is not to be had or where it is too expensive for general use. In regard to its possession of the three qualities we have named; in beauty it is nearly equal to stone, because it admits of the same identical forms, and if properly treated the difference between the two surfaces is scarcely appreciable; in durability it is, of course, inferior to stone. But such beauty and such durability as it does possess are absolute qualities, and in regard to these stucco does not ooccupy the position of an imitative material, for it is obvious that beauty and durability do not admit of imitation. As to expression of cost, stucco expresses more cost than plain unadorned brick, and less than stone. It is, therefore, a less noble material than the latter, so that its use will be restricted by the conditions to be afterwards stated.

We may here remark, in passing, that so long as stucco remains unchallenged as a decorative appliance for interiors, it will be difficult to show why it should not be employed—subject, of course, to conditions—on exteriors also.

Scagliola and painted imitations of marble stand on precisely the same footing. Their beauty arises from various sources. One of these is inherent, due to the colour shades and veining, which, constituting the loveliness of the real object, are found, only in a less degree beautiful, in the representation. The second source of beauty is the taste, skill, and ingenuity displayed in the execution of the imitation, which the practised eye at once detects, while a third class of beauty may be discovered in the deceptive character objected to, and which forms, we hold, a legitimate appeal to the imagination. No doubt such imitations are wanting in beauty of the highest class; they do not engage the greatest faculties of the artist, they do not suggest great thoughts, but such beauty as they do possess is derived from sources which are quite legitimate.

In durability they are, of course, much inferior to real marbles, although greatly superior to most other styles of painting in use for internal decoration. From the smoothness of the varnished surface they are easily cleansed, and at the end of thirty years will be found to have suffered less from tear and wear than plain paint would have done in a third of that time.

As expressive of cost they are of no mean value, though

from their inferiority in this respect to the originals, they will be excluded from use in many cases by one of the conditions I shall specify.

I now proceed to lay down and illustrate the last division of my subject—the conditions which ought to regulate the employment of surface coatings. These are—

1. That they be not employed to imitate a material where the original itself would be out of place.

2. That no object be painted or otherwise made to imitate one material which, from its form, construction, or application, is obviously or necessarily composed of another.

3. That no inferior surface coating be employed where we should expect one more expensive, and no imitation where we are entitled to find the real material, or where the discovery of an imitation would create disappointment.

Everyone may supply himself with illustrations. For example; as to the first condition. Imitation marble should never be used on such positions as ceilings, where the construction is obviously a wooden one; nor on shop-fronts in crowded thoroughfares, where the real material would be destroyed as soon as exposed, and where it would therefore be out of place.

In illustration of the second condition, we may mention that elaborate delicate carvings should not be painted to represent granite, nor iron columns like wood or marble where these materials are unfit for the duty in the way of support or otherwise, which the iron has to perform.

In regard to the third condition. We have said that decorative appliances are valued for three qualities—their beauty, durability, and expression of cost. We may assume that the rank or wealth of the person who owns a work of art, or who makes use of a decorative appliance, will not alter our estimation of its value or fitness, so far as these are imparted by the two first-named qualities, beauty and durability. Our ideas on these points may be said to be absolute, except in so far as they are liable to be changed with regard to beauty by the influence of fashion.

But the third quality we have named is to be considered in a different light. The fitness or unfitness of a work of art or of a decorative appliance, considered with reference to expression of cost, falls to be determined by the rank, wealth, and social position of the person who owns or makes use of it.

The question involved, then, in the discussion of the third condition, under which we assert that imitative appliances may be used, is perhaps, in this view, not strictly æsthetical. We shall give one or two illustrations of our principle.

If we should find in the cottage of an agricultural labourer a figure, say of the "Dying Gladiator," we should receive it as an evidence of great taste, although the statuette should prove to be of zinc electro-plated with bronze. Such an object would be out of place in the possession of a rich collector; but, if I mistake not, few connoisseurs even would be sufficiently purist in their tastes to object to the same figure in bronze plated with oxydised silver. If I might venture to express an individual opinion, I should say there is no more beautiful appliance in use at the present day for coating bronzes. Probably even a zinc bronze-electroplated figure, if large and applied to a useful purpose, such as holding a light, might be found unobjectionable in a similar situation. In a nobleman's mansion, or even in a royal palace, our feelings would not be shocked if we were told that the gold dinner service we were admiring was not solid gold, but silver gilt, while we should feel it to be the essence of meanness if the noble or royal possessor had resorted to the cheap expedient of having dishes only plated on nickel instead of genuine silver. One admires the beauty of the colossal statues which adorn the throne room in the Residenz of Munich without regarding the material of which they are composed. No doubt our respect for them would be much enhanced, whatever we might think of the wisdom of the monarch who had them cast, if we were made aware that they were solid masses of gold. But as no one probably ever indulged in this belief, so nobody was ever disappointed when told that the substance is bronze, and the gold which meets the eye a superficial coating merely. Perhaps the mind may be the better prepared for the gilding of bronze by the knowledge of the fact that its colour is but a lacquer, the bronze itself but a hollow sham, a pretender to solidity, representing bones, flesh, and skin; when it is skin *et prætærea nihil.* If the idea of a figure being mere skin and bone exposes it to contempt, what is to be said of one which is skin only without even the bones.

I have thought it necessary to direct attention pointedly to this custom of coating a common cheap metal with metal more attractive, as well as more expensive in the view of ascertaining whether it is a practice which can be indulged in with propriety, and on what principle; because it is not merely an important branch of the general question we are considering, but because it involves important material interests and has been treated at considerable length by various modern writers on art who are recognised as authorities, and who have arrived at what seem to me to be false conclusions on the subject.

The third condition which I would impose on the use of deceptive coatings, and which I will now repeat, seems entirely to meet the case.

That no inferior coating be applied to a surface where we should expect one more expensive, and no imitation where we are entitled to find the real material, or where the discovery of an imitation would create disappointment.

This mode of viewing the subject brings us back to the question which we have already so far discussed—of worthiness or unworthiness, of propriety or impropriety.

We have a right to expect that every one will support with dignity the rank and position which God has assigned him in the world. No man can do this who resorts to shabby and cheap expedients in his ordinary business even, much more in matters of taste and ornamentation. But shabbiness and cheapness are relative terms. We do not expect our bourgoisie to veneer their walls with real marbles, although we have all seen such finishings. In king's houses in all parts of Europe they exist. The interiors as well as the exteriors of the old Venetian palaces were so decorated. In the residences of many even of the smaller German potentates, and in the mansions of the wealthier of our own citizens, a few examples are to be found. One has therefore a right to expect our own royal residences and public monuments to be decorated with the noblest materials. One could scarcely be reconciled to the idea of having the noblest apartments in the palaces of the Queen of England decorated with painted imitations of rich materials. Our opponents may condemn such incongruities wherever they are found, and in any reasonable terms they choose, for there is no doubt in such positions they would be worthy of all condemnation. If costly materials and costly works of art are to be found anywhere, surely it ought to be in the palaces of that monarch on whose dominions the sun never sets. Genuine gooseberry and mock turtle at a lord mayor's feast would seem absolutely virtuous by the comparison.

Even these rules, however, will not admit of too rigid application. In many instances the work, from want of previous arrangement, is put into the hands of the decorator in a state which leaves him little choice in the matter. Besides, the use of such decorative appliances as a painted imitation of marble frequently affords the means of introducing a mass of rich broken colour in situations where a flat uniform tint would be ruinous to a composition. Of these means even Raphael did not scruple to avail himself in the decorations of the Loggie. The use of such appliances may therefore be occasionally justifiable, where too rigid an application of our rule would exclude their use.

In fact, we cannot, in all matters of taste, establish such

unchangeable canons as those which settle the principles of morality. In matters of taste there are many things essential, and there are many things of little moment. Within the region of æsthetics there is a vast debateable land where individual preferences have free scope for exercise. Within this region it is impossible to ignore or set aside the influence of fashion, whose code, for the time being, is as inexorable as the laws of the Medes, though, unlike those laws, it is ever inconsistent and ever changing.

In matters of personal adornment deceptive expedients have always been less or more in vogue. The Greek ladies, jealous, it may be presumed, of the beauty which they discovered in the low foreheads of certain of the inferior animals, and anxious to rival it in their own persons, invented a species of wig to conceal the upper part of the forehead, and bring the hair as nearly as possible down to the eyes. The faces of the Roman ladies, having been properly softened and prepared by means of a bread poultice plastered over their features at bed time, were daily, after it was washed off with asses milk, brought by means of paint to rival the hues of the lily and the rose. In these days of ours we complacently accept the improvement in our personal appearance effected by the operations of the dentist, and do not grumble at their deceptive tendency. Perhaps their manifest usefulness may in some degree leaven the vanity which frequently induces the patient to submit himself to the operator. In the style of dressing her hair, although woman has found out many inventions since the time of the Greeks, still must her flowing locks be rendered fuller and more flowing by foreign aid. Fiction has still to be added to fact that she may realize her ideal, though that is not the ideal of 2,000 years ago.

We are not so tolerant of paint. It is not easy to define that principle which admits of one lady making herself more charming by adding pounds of hair to the supply which nature has bestowed upon her, and which denies to another, animated by precisely the same amiable motive, the privilege of making up for nature's deficiencies by the use of rouge. Perhaps if the paint were applied after the manner of the Cherokee Indians, so as not to deceive any body, it might satisfy the æsthetical scruples of some of our friends of a certain school.

Sir Joshua Reynolds says in one of his Royal Academy discourses, "If a European, when he has cut off his beard, and put false hair on his head, or bound up his own natural hair in regular hard knots, as unlike nature as he can possibly make it, and after having rendered them immoveable by the help of the fat of hogs, has covered the whole with flour put on by a machine with the utmost regularity; if, when thus attired, he issues forth and meets a Cherokee Indian, who has bestowed as much time at his toilet, and laid on with equal care and attention his yellow and red ochre on particular parts of his forehead and cheeks, as he judges most becoming; whoever of these two despises the other for this attention to the fashion of his country, whoever first feels himself provoked to laugh, is the barbarian."

Now, no doubt there is a right and a wrong in most of these matters, which may be discovered when the search is worth the trouble, but it does not follow that what is right now must be right in all time. We speak not here of fashions which change without apparent reason.

Ten years hence it is possible that gold and silver, now so highly prized as decorative appliances, may, in consequence of a depreciation in the value of the precious metals, have become vulgar and commonplace; but the great principles which ought to guide the artist or decorator will ever remain the same.

In the region of man's inner nature lies a mine, inexhaustible to him who can trace the deep workings of the human soul and embody them in visible form. There must the artist seek the principles which are to guide him in the exercise of his profession. "Custom, the Queen of the World," has a vast dominion, and her subjects are slaves. But these are the unthinking and vulgar. The man of original independent genius will disdain to wear her fetters, or to sacrifice essential principles at her command. Somewhat he may concede, in matters non-essential, out of deference to the powers that be. But as "deep answereth unto deep," he will ever intuitively recognise permanent and intrinsic excellence, and in all matters where essential principles are infringed, will abjure the transient fashions of the day.

DISCUSSION.

Mr. J. G. Crace would preface the few observations he addressed to the meeting by stating the great pleasure he had derived from the paper that Mr. Purdie had read to them. He thought it not only reflected great credit upon that gentleman, but upon the profession to which Mr. Purdie and himself belonged. It was very gratifying that a gentleman so employed could bring to bear on such a subject so much research, intelligence, and knowledge as he had displayed. He had made the subject both interesting and instructive to them, and though he (Mr. Crace) might not quite agree with all that had been brought forward, he thought their differences would not be material. First of all, he thought he might allude to a little confusion in Mr. Purdie's argument with reference to imitation. The true object of art he took to be imitation; the right application of imitation was another matter. The more perfectly a painter represented the subject of his picture, the more real and perfect would be his excellence in his art; but in using imitations the question of appropriateness and suitability must be borne in mind. He would begin with the use of stucco on the exterior of buildings. He thought, as influencing the progress of art, its use had been pernicious. It certainly afforded great advantages in the preservation of the exterior of buildings, but it also furnished such facilities for false representations and bad construction, and for hiding so many faults, that whatever its advantages might be, he considered they were neutralised by these objections. If there had been no stucco, long before this our artists might have introduced the beautiful forms and decorative features to which brickwork could be so well applied. He maintained that, in our street architecture, we were only now beginning to realize the beautiful forms, colouring and architectural features of which brickwork was susceptible. Mr. Purdie had instanced some glorious examples in the buildings which abounded in Milan and other parts of Lombardy, where the most beautiful forms, with good effects of light and shade, were produced by the employment, not of moulded bricks alone, but by the proper application of ordinary bricks, placed at certain angles and depths. If buildings such as were now designed had been erected in our country 20 or 30 years ago it was absolutely certain that architects would not have attempted to conceal the brickwork by a covering of stucco, so as to make it look like bad stone, in addition to which a row of buildings monotonously alike were often painted a variety of shades, utterly destroying all harmony of effect. He thought that in architecture the mode of construction should be apparent, and as much as possible of the real material employed should be displayed, and made to form the ornament of the building. He now came to the interior. Stucco in the interior of buildings assumed a different position altogether. It became then a legitimate covering to the construction, imparting a surface to a rough material. In ceilings, cornices, and walls such an application was useful and legitimate, unless they were content to have the brickwork shown inside, which he did not think would be satisfactory. They covered it with a material which could be made to assume any required form and colour. He thought, however, the great sin of ordinary house decorators was to use their paint when it was not wanted. In building a house, instead of leaving the wood work to show itself, which he thought a legitimate plan, they put on several coats of paint, destroying the sharpness of the

mouldings. If the wood were plain deal, and if a little more money were spent in the preparation of it, and then it were simply varnished and allowed to pass for deal, it would look infinitely better than half the elaborate colouring and graining put upon it. The wood itself might be legitimately decorated by light or dark lines of colour or by gilding. On one occasion he was called in to decorate a building in Scotland, where he found the wood work of pitch pine, beautifully executed, but they had begun to paint it. He stopped this, and merely had the wood varnished, and though this was done many years ago it looked as well as ever. Then again, with regard to graining, he thought this was too freely used. A whole tint worked up with varnish would look better and last as long as imitations of maple or other fancy woods, and the idea of a sham would be got rid of. The same remarks applied to imitation of marble. A corridor might often be made far more tasteful and equally durable, with plain colour properly applied. Marbling was perfectly unsuitable for the style of houses in which it was frequently applied, though, if a hall presented a fair architectural appearance, he had no objection to imitation marbling, where the real marble would not have been out of place. Then again, with regard to gilding. He thought "white and gold" was a perfect god-send to ordinary house decorators. They took no trouble to exercise taste or judgment by decorating with harmonious arrangements of colour, which presented considerable difficulties to incompetent persons, but felt themselves safe in recommending white and gold. It was sure to look simple and beautiful, but it prevented the march of taste in the decorative arts. Sometimes a delicate tint of green was suggested, but there appeared to be no desire to get beyond the hacknied style which prevailed too much in the present day. He thought men should endeavour to improve upon what had been done before. Mr. Purdie in his paper had condemned the improper application of imitation, in which view all persons of sound taste must agree. Mr. Purdie had also remarked that they would, of course, expect in a nobleman's house that silver or gilt plate would be genuine; but that in more humble houses imitations were allowable. He could not agree to that. He thought that in a humble home it was bad taste to ape the splendour of royalty or nobility, however cheaply gilt objects might he produced. Silver was better than gilt brass. It was more satisfacfactory to use a material which was what it pretended to be, rather than an imitation of something else.

Mr. J. Beavington Atkinson said they ought to feel greatly indebted to the author of the paper for drawing the very important distinction which existed between ethics and æsthetics. No doubt much confusion had of late years been thrown into the sphere of the fine arts by mingling together elements which belonged rather to the sphere of ethics than to that of æsthetics. The danger of this was the greater because mere rhetoric was exceedingly taking with the general public. A critic, for example, who should write that a picture had thrust a dagger at the moral sense of the public would probably find an echo in many drawing rooms in this country, and yet he believed persons acquainted with the subject would know that such a criticism was in all probability little better than nonsense. While he spoke thus strongly he yet was one of those who firmly believed that there were certain fundamental principles which governed the constitution, and, if he might say, the morality of the fine arts; and the first and most essential principle was this, that the idea sought to be expressed, the essential and central thought to be embodied, should be of the noblest kind, and that being established and fairly rooted in the mind of the artist, he thought secondly would come the consideration by what instruments and by what means the artist might best incorporate and express that idea. Those two principles he believed constituted the truth, the probity, and the purity of the fine arts. Now, as to the means which an artist had to employ, he really knew of nothing more practical or anything better than the doctrines of old laid down respecting drawing, composition, light, shade, and colour. He believed in these would be found the true decalogue of the arts. As for the material, this, as he had already indicated, must be subordinate to the intent. A statue might be executed in clay, terra cotta, plaster, marble, or gold, and he ventured to say of all those materials the gold would be the least admirable. The heroes of the world were not accustomed to be clothed in gold. They spoke for what they were, for what they had done; and the expression, the intent of the work constituted in fact its true nobility. Now, as to the subject of imitation, important and he thought true distinctions had been laid down by Mr. Purdie. He would add to what that gentleman had said that perhaps the primary question, after all, was what should be imitated? A brass kettle in a Dutch picture could not have much dignity, but if they took Holman Hunt's picture of the "Finding of Christ in the Temple," and if they observed the fidelity with which the artist had there imitated the transparency and the expression of the eye of the Saviour, he thought there they would find that imitation had attained to something like divinity. Imitation, therefore, was not an evil, but it was a means to an end. That was obvious: and he thought it was undeniable that the more perfect the imitation the better. With regard to the perfection of that imitation and the mode of its application, much depended upon what the artist should emphasise and what he should leave out. If he directed his attention to what was really great, that imitation would then attain a great and dignified end; but if he descended to what was small and paltry, then his work was so far marred, and the imitation, which as he had said, was in itself a worthy instrument, then became degraded. So far for imitation and its worth, and the mode in which it should be employed. He would now say a word upon what had incidentally fallen from Mr. Purdie, on the subject of coloured statues. He might state upon authority, for he had often conversed with Mr. Gibson on the subject, that the purpose of that great sculptor in colouring statues was not to attain to naturalistic imitation, but rather to conventional treatment. He (Mr. Atkinson) was not an advocate for the colouring of statues. It was a most difficult question; but it was, perhaps, right to put in this plea—that statuary, when coloured, became the sister of coloured architecture. Mr. Purdie would allow that it was possible to decorate the interior of a building to such an intensity of colour, that white marble would appear cold, crude, and inharmonious. That this had been felt in all countries, and in all ages, was manifest by the uniform practice of artists. Bronze was, in fact, a colour. The employment of coloured marbles was of course the adoption of colour; so that, independently of the mere question whether they would colour white marble, which in itself was a lovely material, they could scarcely resist the conclusion that, under certain circumstances, coloured statues become inevitable. He need not say the detailed and varied management of colour in such cases was most delicate and difficult, and must be a question of subtle artistic treatment. What was the conclusion? He thought it was simply this—that a work of art depended for its worth principally upon the idea which it expressed; secondly, upon the aptness of the instruments employed as the language for expressing that idea; and thirdly, that the material might be valuable on many accounts, for durability and for other qualities, but that all such questions of material should be kept subordinate to the idea to be expressed, and the thought and purpose which the artist endeavoured to embody. Reverting to the distinction which had been justly drawn between ethics and æsthetics he would say that works executed on the principles he had ventured to inculcate, though not falling directly within the sphere of ethics, were in all points consonant, and might be made co-operative with true morals and pure religion.

Mr. Varley remarked on the subject of imitation, that the failures of great men were lessons to those who came after them. He mentioned that Sir Joshua Reynolds repeatedly failed to convey to canvass a correct likeness of his friend John Hunter when in his own studio. The subject was out of place; but when he painted the great anatomist as engaged in his avocation, he succeeded in producing a marvellously life-like portrait, which was the admiration of all who beheld it in the present day. Mr. Varley alluded to what he considered a great defect in portrait painting, viz. treating the subject with sombre tints instead of those bright colours in which Sir Joshua Reynolds delighted, and which served to bring out the delicate tints of the flesh with greater brilliancy and effect.

The Chairman, in proposing a vote of thanks to Mr. Purdie for his highly interesting paper, remarked that he could not agree with some of the observations that had fallen from Mr. Atkinson. He was startled to find that that gentleman justified the colouring of statues, and not only justified it, but did so in terms which appeared to contradict the conclusions he subsequently arrived at. Mr. Atkinson had said that, in colouring the statues at the late Exhibition, there was no endeavour strictly to imitate nature—not to produce the most perfect imitation possible, but merely to conform to conventional ideas—to lower high art to the conventional taste and tone of the day, and to attract admiration from those whose education had not taught them to appreciate the highest style of art. The essence of sculpture was form, and marble was a material which was specially suited for conveying the true spirit of sculpture to the mind. Colouring took away the effect upon the imagination; it destroyed the great principles upon which sculpture was based, degrading it to a lower class of art. Another branch of the subject was what should be understood by the legitimate use of imitation. There was a pleasure to be derived from the contemplation of the imitation of the beautiful objects of nature, apart from the gratification afforded by the objects themselves. The works of Barry, on the walls of the room in which they were assembled, were an imitation undoubtedly, and the perfection with which the objects were represented was in itself a source of pleasure. This was an instance of an appropriate employment of imitation. He was obliged to Mr. Crace for the suggestion as to the more extended application of the ordinary woods in the fittings of rooms. At the same time, as the practice of painting and varnishing seemed to have been almost universally adopted, it was only fair to infer that there were some good reasons for the universality of this practice, and that by some means the conclusion had been arrived at that painting was the best mode of covering defects and giving durability. It was, therefore, reasonable to suppose that the practice was supported on some grounds of public utility and economy. With regard to another branch of imitation which had been so thorougly anathematised by Mr. Crace—stucco, he would say that the reason why ornamental brick buildings had not been erected in this country, as in Italy or Flanders, had been mainly owing to the fact that, until the last few years, the manufacture of bricks was under the control of the Excise, by whom the size and mode of manufacture were restricted within certain defined limits, which might not be departed from. But when they got rid of the excise, and were allowed to make bricks as they pleased, it had already been seen how such materials might be successfully used in the ornamentation of our street architecture. If they were to decry all imitation, they would deprive themselves of some of the highest pleasures they had. The drama had been referred to as an imitation, as it undoubtedly was; but although the drama at this moment might not flourish as it did a few years ago, yet those who recollected the elder Kean, Kemble, Young, and Macready, must feel that but for the existence of those men the country would have been deprived of a high and legitimate source of pleasure; and they could only hope that by some change of circumstances the time might again come when greater encouragement would be given to that branch of art. He now begged to propose a cordial vote of thanks to Mr. Purdie for the very interesting paper with which he had favoured them.

The vote of thanks was then passed.

Proceedings of Institutions.

Birmingham and Midland Institute.—A course of three lectures on "Light" was delivered by Mr. James Phillips, in January and February last. Mr. H. Noel Humphreys delivered a lecture on the 5th February, on "The History of Writing." The Rev. C. P. Wilbraham, Rural Dean of Newcastle, delivered a lecture on the 15th February, upon "Iceland and its Geysers." On the 22nd and 29th February, Dr. Alfred Hill, the borough analyst, delivered two lectures on "The Chemistry of Explosive Compounds," illustrated by a series of experiments. On the 7th March, Mr. William Willis delivered a lecture on "Siemens and Gore's Furnaces." On the 14th and 21st March, two lectures "On the Grave and the Gay in Art, as illustrated by the works of William Blake, the visionary, and George Cruikshank, the humourist," were delivered by Mr. Sebastian Evans.

Crewe Mechanics' Institution. — The eighteenth Annual Report states that, although a considerable amount has been expended in the enlargement of the Hall, additional anterooms, coffee and smoking room, increase of library, &c., the retiring council has the satisfaction of announcing a balance of £90 to the credit of the Institution. The maximum amount of any previous year's receipts has been £375, while the last year's income is no less than £576. In the educational department the past year has been one of the greatest success. The classes have been more numerously attended, and have afforded 230 youths and females means of extending that education, the foundation of which was laid in the elementary school. During the summer two pleasure excursions took place; one to Windermere, the other to Birkenhead, to visit the channel fleet. These were a source of profit to the amount of £24. A new feature in the year's programme has been the establishment of cheap concerts on Saturday evenings, which have met with such encouragement as to augur a much greater success for the future. They have been self-supporting, and have proved, not only a considerable stimulus to the amateur musicians of Crewe, but also means of innocent amusement to the people of the town and neighbourhood at the close of the week's duties. The committee thank those ladies and gentlemen who volunteered their services, and without whose help they could not hope for a continuance of these entertainments. With reference to the educational department, the council say that, while deeply sensible of the many advantages which a well-conducted institution offers, they are unanimous that "the one thing needful" for a permanent success is the good management of the Evening Classes. Upwards of six pounds was granted by the council, to be divided amongst those students who successfully passed examinations in the various branches of education taught in these classes. The local examinations included Mechanical Drawing; Free Hand Drawing; Reading, Writing, and Grammar; History and Geography; Mechanics and Euclid; Algebra and Mensuration; Arithmetic. Prizes were also given for Science and Literature, the examiners being the Rev. A. F. Chater, M.A., Rector of Nantwich, and the Rev. Arthur Rigg, Principal of the Training College, Chester. These gentlemen expressed a very favourable opinion of the proficiency of the youths. A supplemental prize was given for Political and Social Economy. Classes in the several branches of mechanical, figure, and ornamental

drawing, still continue in connection with the Institution, under the instruction of the Head Master of the Government School of Art. At the Government Examination, conducted by the Government Inspector of Schools of Art, three medals and three second grade, or highest prizes, were awarded. During the past year upwards of £20 has been expended in new books, adding 100 volumes to the former stock; thus making the total number in the library 2,504. The number of volumes issued during the last twelve months exceeds, by 1,200, that of any corresponding period. Plans and specification of patents still continue to be received, and have been much referred to on a variety of subjects. A smoking-room has been opened, and receives a fair share of patronage; it is intended to open it as a coffee-room also. A chess-room has also been added since the last report was issued. The chess club numbers upwards of 50 members. The gymnasium is in a flourishing condition. The principal entertainment during the past year was the twelfth annual *soirée*, held in June.

ART-WORKMANSHIP PRIZES.

The correspondent who addressed us on the subject of the Art-Workmanship Prizes, thus resumes his remarks of last week.

I cannot but recommend to those who compete for the first prize of the current series to use the cast from the object itself; by aid of the photograph alone, they cannot perfectly see even one face of the model, and the side-view of it—which shows an exquisitely beautiful piece of decoration in the volute and its eyes, composed as the latter are of full-blown lotus-flowers—is, one might venture to say, inexplicable, or, at any rate, so presented as not to give a full idea of the theme. It is not impossible that in some districts of the country, where natural or commercial facilities exist, clay might be cheaper than either of the materials designated for this subject. We are very much in want of workers in clay; almost all carvers are—and every one of them ought to be—possessed of some skill in manipulating that material; their skill may be cultivated by such a series of prizes as that now in question, and it is probable that a larger market exists for works in clay than can be expected with regard to such as are executed in the comparatively costly marble or stone. Upon the use of wood as a material of decoration our people seem to look with unaccountable suspicion. Englishmen were once almost at the top of the tree in wood-carving, yet how rarely do we see a modern example of this craft, except some wholly foolish and clumsily-applied bit of "upholsterer's" work. The main obstacle with regard to the use of clay by the competitors in such a case as this is probably the difficulty, in some localities, of getting it formed, so to say, into terra-cotta. Good kilns and careful burners are, nevertheless, rife in some parts of the country, and accessible from others. Probably the Society of Arts may, at some future period, offer a separate prize for design and execution in terra-cotta.

A certain amount of invention, or rather of that power which stands next below it in art, adaptation, will be exercised by the competitors for the prizes offered in the fourth division of the first class of the series now in question. This is for wood-carving, to be rendered in the solid, from a drawing attributed to Holbein, of a design for what appears intended as an hour-glass stand. This is an admirable work, and may readily be applied to modern uses, as a watch-holder, or an ink-stand, according as the carver may please to employ its faces or its upper surface. The object rests upon three feet, and has figures of fauns at its angles, while on each of the faces between those figures appear disks, or rather shields, any of which, if made open instead of closed, would serve to hold a watch. The vigorous and expressive attitudes of the figures will commend them to the careful study of the carver. Their arms are raised above their heads, and bent back towards the body of the work itself. Above these figures, in the drawing, a tall stem rises, this is furnished with doors, which, on being opened, display the hour-glass itself. Between the body and the stem is a mass of beautiful mouldings, but the most effective section of the design is its superb top, whereon stand figures of boys, each holding a scroll spread out, *displayed*, as heralds say, and inscribed on its surface. A compass card seems to have occupied the upper surface of the body; this is invisible in the design, but is sufficiently indicated by a supplementary illustration that is placed by its side. The spirit of this work is such that no one endowed with artistic feeling will overlook it. In almost every section genius is evinced. The designer was a master of his craft, and could as well give expression by the subtle curve and springiness of the scrolls forming its feet as by the graceful poising of the boys and the elegance of the fauns. As produced in the "romantic" spirit of the German Renaissance style, the composition is beyond praise. The execution of the figures and their perfect combination with the minor elements of the work are unchallengeable. The whole forms a model for the wood-carver's art. Whoever wins the first or the second prizes offered for this article will deserve great praise. All who compete will profit by studying it.

The next theme for competition that presents itself as calling for special remark is, if possible, superior to the last. It is so inasmuch as it is designed in a style that is wholly pure and unmixed with the *quasi*-grotesque motives of German Renaissance art. Probably for modern uses the latter is perfectly suitable, but, to an eye trained by long contemplation of severe models, there is something surpassingly attractive in the thorough elegance and spirit of the former. This is a picture frame, to be carved in wood, after an Italian work, probably executed in Venice about 1550, and now in the possession of Henry Vaughan, Esq. With all the richness of this work the character of grace predominates. Grace is, in all decorative compositions, the supreme quality. The frame itself shows a "flat," upon which is placed an infinite variety of lovely scrolls and foliage, in the knots and on the branches of which little boy-genii are sporting with that life-like vigour and spirit which distinguished the best days of Italian design. The angles of the frame are particularly worthy of attention, because that portion of such a design as this is the test of power in treatment. A scroll will, if dexterously managed, almost compose itself after its elements are decided upon, and, with due care, variety enough may be imparted in minor parts, while the scroll of foliage proceeds onwards to its end. At the angle the difficulty occurs of happily uniting two lines which are perpendicular to each other. In the work now under consideration this difficulty has been triumphantly dealt with. The exquisite carving displayed in the small figures of lizards, peacocks, and other birds, such as cocks and partridges, is surprisingly full of beauty and fancifulness. A very pretty point of design, which is thoroughly Italian in character, is observable in the middle of the lowest side of the frame. This is filled by a springing fountain; on each side of it an elegant grotesque demi-figure, whose tail runs into the foliage, presents itself. The crispness and clearness of the leafage, no less than its tender and pure elaboration, are beyond praise.

By comparing the last-named example with that which immediately precedes it in the order of the programme of prizes, the student will discover a marked distinction, not alone in their design, but in their execution. I refer now to the head of a harp of the period of Louis XVI. or, to speak more correctly, that of Louis XV. (1715-1774). The latter was, with all its shortcomings, the better and nobler period of French design. Anyone can see that between the periods of the Italian picture-frame and that of the head of the harp, something had come into play which was potent enough to change all men's ideas of art. If I were addressing a technical audience it would

suffice to say that art had, in the interval, lapsed into "decoration." Bold, and in many respects beautiful, as is the head of the harp, it lacks the exquisite refinement, the perfect elegance, and vigorous grace of the foliage and animals on the picture-frame. It is not because one is more elaborate than the other, for this is hardly the case; nor because the object upon which the artist had been employed is in the former superior to that of the latter as a field for the exercise of decorative power. The truth is, that to an able designer the harp-head supplies by far the noblest opportunity; indeed, there are few finer themes in the reign of ornamental design than such a one, yet, with this singularly great advantage to help him, the Frenchman has not even approached the Italian who went before him. Into the history of the great change in the well-spring of modern art this is no place to enter. Let it suffice that the "naturalistic" spirit of times later than those which produced the Venetian work wrought so effectually upon design that artists sought to imitate all they saw before them, and in the effort abandoned much that had been learnt by their predecessors. The most valuable thing thus abandoned was the right of selection or choice of beautiful elements of natural forms. Had they given, as many of the Germans did, unflinching obedience to their own law of imitation, the French artists of the period of Louis XV. might have done better, but decorative design, as in the harp-head before us, presumes a departure from nature, accordingly that departure should be thorough and free of mere imitation; if it is not so, the clash of two principles of art is, as here, painfully obvious in a single figure. How, for example, shall the figure of a genius whose body terminates in foliage be treated as a simply natural object?

The harp-head now in question is composed principally of the figure of a boy-genius, who seems to balance himself at the highest point of the instrument. His action, although beyond certain limitations of art, is full of vigour and grace. Its fault is in an exuberance of unchastened form. The circle predominates in all its elements, whereas, in the decorations of the picture-frame, the elemental line is flowing and flexible, and, so far, better adapted for decorative service. The tail of the boy forms a scroll of rich but rather ornate character. Festoons, which are elaborately wrought, form essential features of the design, but, as they are merely imitative in execution, they cannot be very highly estimated. The festoon is, in its very nature, but a poor and somewhat vulgar substitute for the ever elegant scroll or running foliage. Beneath the figure of the boy, and as if suspended over the top of the harp, is a satyric mask with the usual accompaniments of Pandean pipes, wreaths, horns, fruit, flowers, &c. The whole forms a composition rich and varied enough to please the untaught eye, but, inasmuch as it indicates a return to the Roman manner of copying natural facts, in preference to an intelligent dealing with them in the power and spirit of the Greek, Gothic, and true Renaissance carvers, it is inferior to the works produced by those masters of design. It will be obvious to everybody that the intelligence called into play by the execution of a festoon copied from natural flowers, is inferior to that exercised in the mastering of the elemental forms of those flowers, and composing a new thing out of them. This is the difference between the arabesques of the Italian work and the bunches of fruit, &c., of the French one.

No question of styles or schools is involved in the next example I select from the list of prizes. Raphael's "Graces" is too well known and too beautiful a theme to need praise of mine. As a study for *repoussé* work in metal, as well as for enamel painting, it is perfect. Its adaptability to processes depending on pure form in the one case, and on pictorial treatment in the other, is worthy of note. With regard to the theme of two boys selected from Raphael's cartoon of "The Sacrifice at Lystra" as the subject for the first prize for painting on porcelain, it seems to the writer much inferior in value to that of the "Graces," inasmuch as it is rather pretty than beautiful, and whether such was, or not, the character of the cartoon in its original state, that famous work is certainly not now beyond challenge in execution. It does not seem to be generally known that there exists in the library of Vienna a group of antique female statues, undoubtedly representing the Graces, Aglaia, Thalia and Euphrosyne. This group is nearly life-size of three beautiful females, of an earlier and less developed period of life than that Raphael depicted, but so nearly resembling, in their attitudes, those in the design before us, that there can be little doubt that the artist availed himself of the antique conception. There are many similar versions of the theme in existence.

I ventured to enter freely upon the subject of the true and the false arabesques, as displayed by the Italian picture-frame and the French harp-head, because the spirit of the remarks upon the former may be applied to the Flemish salver—designated as the model in the second section of Class 2 (Repoussé work). The same may be said with regard to the arabesque after Lucas Van Leyden—used for the class of etching and engraving on metal, and of the German work of a later date, which supplies a theme to the second sections of the enamel painting and porcelain painting classes, as well as to the class of engraving on glass. It would be hard to find nobler subjects than these.

On another occasion I may be allowed to offer some observations upon the themes chosen for the classes of chiselled iron, ivory carving, bronze chasing, cameo cutting, die sinking, gem engraving, &c.

Fine Arts.

French Opinion of English Art.—M. Ernest Chesneau, a writer on art, has recently attracted considerable attention by two small books on the art and artists of France and England. The first of these works is entitled, "Les Chefs d'Ecole—Painting in the Nineteenth Century," and treats of David, Gros, Géricault, Decamps, Meissonnier, Ingres, Flandrin, and Delacroix. It has reached a second edition, if not a third, and has aroused attention by the freshness and originality of the tone of the criticisms. M. Chesneau belongs to what is called, in France, the romantic, but which would be more fairly designated the natural school; he is severe on the *quasi* classicality of David and the colourless character of M. Ingres's works. His chief admiration is reserved for Gros, Flandrin, Meissonnier, and, especially, Eugène Delacroix. It is only from a critic of this school that English art, peculiar as it is, and resembling none other, could possibly obtain anything like due appreciation. Any French critic looking at the works of English artists, and measuring them by the artificial rules which guide the majority of painters on the Continent, would infallibly arrive at the conclusion, once drawn in France with respect to Shakespeare, that although there might be much evidence of natural genius, there was no art in the true sense of the word. M. Chesneau is not of this school, and therefore his recent work, entitled, "L'Art et les Artistes Modernes, en France et en Angleterre,"* will be read with interest by all who take an interest in the subject. The author takes for his text the English works exhibited in Paris at the universal Exhibition of 1855, and in London in 1862. The first sentence reveals a curious fact with reference to the acquaintance of the Continent with the painters of England:—"There is an English school," and, M. Chesneau adds "it has existed for more than a century, and yet is unknown in Europe." He describes the astonishment created in France by the appearance of a long series of pictures in that Exhibition which evidently came from no school with which French criticism was familiar. "Up to that time," he says, "we

* (Paris, Didier and Co.)

had refused to acknowledge the possession of any artistic quality in the English mind; then, by an unreflecting impulse, the result of surprise, it was lauded far too highly. This infatuation," he adds, " which is not yet quite passed away, would have been more marked, and moreover excusable if, in 1855, as now (1862), the works of the English painters of the eighteenth century had figured at the Exhibition." M. Chesneau will not admit that Hogarth was, in the high acceptation of the term, an artist; he denies him drawing, colour, composition, and style, but he acknowledges that his pictures, when once seen, are not easily to be forgotten for their originality, force, and satirical humour; and of the pictures by that artist, exhibited at South Kensington in 1862, he says:— " The attitudes, the action — astonishingly true and infinitely various—are not only always lifelike and just in their triviality, but are sometimes noble and touching. In some of the figures of women and children there is elegance and *naïveté* that perhaps even Reynolds and Lawrence could not have expressed—as, for instance, in the ' Marriage à la Mode,' the girl who is drying her tears at the quack-doctor's, and the young person in a rose-coloured skirt and black mantle, in the picture of the ' Conversation.' " Reynolds and Gainsborough draw forth earnest admiration from M. Chesneau, who says, " that if British art had produced many such painters as these, the French school might really feel some alarm." His appreciation of these artists well deserves attention; his criticism is careful and discriminating, and few will differ with him when he says:—" The talent of Reynolds exhibits a magnificent conquest over the will; that of Gainsborough, the spontaneous opening of a flower going through its natural formations to the production of its fruit. This fruit is of an exquisite flavour." M. Chesneau criticises, at some length, most of the principal works, both of Reynolds and Gainsborough, with an affectionate admiration. Lawrence charms him by his pretty graces; he admits his fascinations, but he cannot overlook his want of force, truth, and firmness. For West, Fuseli, and Etty he has but small admiration. Wilkie can scarcely be appreciated by a foreigner; and M. Chesneau, while admiring his originality, does not, evidently, fully appreciate his intense humour and power of observation and reproduction. John Constable stands high in the estimation of M. Chesneau; but the artist that interests him most deeply of all, perhaps, is Turner, of whom he says:—" He had but one desire—a dream of prodigious audacity—he would paint light." It is a bold and a happy stroke of criticism. M. Chesneau is as severe as most critics on what he calls the madness of Turner's last works; but he says:—" It is impossible to give, in a few lines, any idea of the imagination of this artist; the analysis of his works would require a volume." And further:—" Turner was an artist of genius, too rarely complete, but often sublime." These few notes will be sufficient to recommend M. Chesneau's work to the attention of English artists and amateurs, but it is evident that he has not yet become intimately acquainted with the whole school of British art. Mulready is among the artists of whom his knowledge is undoubtedly but small, but at the same time the spirit evinced in his criticisms is so clear and honest, that it may be taken for certain that he will seize fresh opportunities of enlarging his observation, and thus aiding in the diffusion of a knowledge of English art and artists on the Continent.

Copyright.—Mr. Black has withdrawn his Copyright Bill, and obtained leave to substitute for it a bill for the consideration and amendment of the law on this subject.

Sale of Illuminated Manuscripts.—The recent sale of the famous manuscripts belonging to the Duchess de Berry drew all the Quartier St. Germain, as well as all the artistic and antiquarian world, to the Paris mart, and the prices obtained exceeded all expectation. The chief lot consisted of one of the most famous books in Europe, the " Livre d'Heures of Henry II. and Catherine de Médicis," a little volume, not more than four inches long, bound in red morocco, and bearing the monograms of the king and queen. The manuscript is illustrated by fifty-five miniatures of the royal family of France, executed with great ability. Part of these portraits were executed specially for the work, the rest having been since added as illustrations; they include, amongst others, likenesses of Henry I., II., III., and IV., Francis, I. and II.; Charles IX., Louise of Savoy, Margaret of Orleans, two of Mary Stuart, Elizabeth of France, and Catherine de Médicis. The little gem was put up at 25,000 francs, but the biddings soon reached 60,000, when the last competitor, an Englishman, gave in, and the Emperor was announced to be the purchaser. It is understood that the manuscript will be placed in the Louvre. The sale consisted only of twenty-five lots, which, however, realized the sum of 103,000 francs (£4,120). The other principal items were:—A book of prayers, written before 1231, for Louise of Savoy, mother of Francis I., ornamented with miniatures, purchased for the Musée des Souverains, at 3,210 francs; " Liber de vitâ Christi " (de Ludolphe le Chartreux), illustrated by many exquisite miniatures, 15th century, 3,800 francs; " Gaston Phœbus's Book of the Chase; and " The Book of Medicine for all kinds of Birds," by Jean de Franchiere, 15th century, 5,000 francs. These two manuscripts are illustrated at almost every page with scenes of the chase. A magnificent manuscript, " Heures Satines," of the 15th century, illustrated with 107 large miniatures and twenty-four vignettes, recalling the style of Fouquet, and supposed to be by a pupil of his school, brought 3,050 francs. Several of the lots were purchased for the Imperial Museum.

Stained-Glass Exhibition.—The arrangements for this exhibition, which is to be held in the South Kensington Museum, are now nearly completed. The exhibition will open very shortly.

Florentine Mosaics are now used with good effect in ornamenting the binding of books. The mosaics are let in either as a centre-piece or in the corners, and the idea might be carried out very well with the earthenware tesseræ made in England.

The Ghiberti Gates.—Arrangements have been made by the South Kensington Museum for taking casts of these celebrated gates, and also of the Perseus, by Cellini, from which copies are to be reproduced in metal for the collection at the Museum.

Taylor Prizes (Ireland).—It is known that the sum of £2,000 was bequeathed by the late George Archibald Taylor, of Dublin, for the promotion of art in Ireland. This has been applied to the establishment of a perpetual endowment for the encouragement of art-students, the management of the scheme being entrusted to the Royal Dublin Society, in conjunction with the trustees of the will. For the year 1864 the trustees offer the following prizes, open to art students of Irish birth or attending a school of art in Ireland, to be awarded at an exhibition to be held on the 23rd November, 1864, at the house of the Royal Dublin Society. 1. For the best Drawing or Cartoon in Chalk, the figures to a scale of three feet (two or more prizes each), £10. Subjects—" The Good Samaritan." " The meeting of Æneas and Dido, after the Shipwreck." 2. For the best Landscape in Oil Colours, £20. To be increased or lowered in amount or wholly withheld, according to the merit of the works. All works must be delivered before two o'clock on the 14th of November, 1864, at the house of the Royal Dublin Society, Kildare-street, Dublin. The prizes are open to all students of art, of either sex, who shall have attended for two years at least a school of art in Ireland, or who, being of Irish birth, shall have attended for a like period a school of art elsewhere, and who shall produce works of art displaying conspicuous merit or high promise of future excellence, at an Exhibition to be held annually in Dublin. When high artistic talent shall be manifested, a Taylor Scholarship will be awarded, which may be held for a second and a third year, provided the student shall produce in each year a work of sufficient merit. The

prizes are awarded upon the report of judges, one of whom is chosen by the Council of the Royal Dublin Society, another by the Royal Hibernian Academy, and a third by the Governors and Guardians of the National Gallery of Ireland. Last year the judges awarded to Mr. J. Fergus O'Hea, for his picture, "Revenge and Pity" (Collins' "Ode on the Passions"), a premium of £10, but their report on the competition is not favourable. They "express great regret that the expectations of the judges of last year, in recommending a defined and simple subject for competition, have not been realised. In each of these productions they have sought in vain for examples of correct proportion and accurate design; and it is obvious that while the youthful students have been tempted to indulge largely in the attraction of colour, they have disregarded the more important requirements of patient and conscientious study of the living models." To the work of Mr. J. Fergus O'Hea, in which these deficiencies are, perhaps, the least conspicuous, they recommend the award of the above named premium.

Manufactures.

Gratuitous Schools at Mulhouse.—Many departments are just now taking up the question of establishing communal libraries for the use of the industrial and rural population of their districts, and it is interesting to know what has been done by eight industrial establishments at Mulhouse, in the way of providing instruction for their workpeople. In three of these establishments schools have existed since 1848, in three others, schools have been formed in 1854 and 1856, and two have opened schools in 1863. In six of these schools the lessons are given in the day, during the hours of work, and in two others during the evening, after work is over. In all the schools reading and writing in French and German, and the four rules of arithmetic are taught. Four of these establishments have libraries attached, and the books consist chiefly of voyages and travels, history and moral tales; periodicals and newspapers are taken in, but all publications of extreme views in religion or politics are excluded. In one of the establishments there is joined to the school and library a workroom for the girls, under the direction of the wife of the manager of the factory. All the girls under 16 are assembled twice a week in this workroom, and are taught to sew and mend their clothes, so as to fit them in due time for their duties as mothers of families.

Turin Cotton Exhibition.—An exhibition of the various kinds of cotton cultivated in Italy has been organised at Turin, by the exertions of M. Devincenzi, Member of the Italian Parliament, and who represented Italy at the Exhibition of 1862, as Commissioner-General for that country. The number of exhibitors is 207, coming principally from the Tuscan Maremme, Sardinia, Sicily, the Campagna of Rome, and the Neapolitan provinces. The number of different cottons shown is 685; of these 306 are Chinese (white), 48 Chinese (brown), 82 of the herbaceous species, 7 of the hairy species, 80 of New Orleans, Louisiana, and North Carolina, 110 Sea Island, and 52 of other qualities. This enumeration shows how seriously cotton cultivation has been taken up in Italy, and the quality of the cotton exhibited is highly satisfactory. All that is wanted is to familiarize to a greater extent the Italian cultivators with industrial processes. The prospect is most encouraging. A company has just been formed in Milan for the cultivation of cotton, on a large scale, in Sardinia. The company has already purchased machines and implements for its operations, which will commence upon 250 hectares of land in the territory of Oristano.

Prices of Earthenware.—The earthenware manufacturers of the Potteries have advanced the prices of earthenware 5 per cent. on the net value in the foreign trade, and from 5 to 7½ per cent. in the home trade. This rise is occasioned by several recent advances in the price of coals, and by the increased value of borax and several other articles used in the manufacture.

Cornish Mines.—The annual consumption of timber in Cornish mines amounts to nearly 100,000 load, and involves an expenditure, for Norway timber alone, of about £200,000. Large quantities of American timber are also used, averaging in value about £40,000.

Commerce.

Coal Fields in Brazil.—A few years ago reports were current respecting a vast coal-field, sixty square leagues in extent, lying about forty miles from the coast of the Atlantic, in the province of Rio Grande do Sul, but nothing precise or definite as to the truth of the statement was known. Within the last year or two, however, Mr. Nathaniel Plant has been surveying the southern province for the Brazilian Government, and his official report confirms the fact of a valuable and extensive coal field existing there, of which full details were recently laid before the Manchester Geological Society. The locality is on the extreme south, just on the border lands between Brazil and Uruguay, at a distance from the coast in a direct line of about sixty miles, but an extensive shallow lake intervenes, and the sea-board is made up of a vast extent of dangerous sands and low banks. The nearest point to which the coal approaches a port of embarkation is about twenty miles above the mouth of the Jaquaro, so that water carriage exists from the Atlantic port almost up to the coal-field. The area of the coal-field is conjectured to be about 150 square miles. An engineer is at present surveying the district for the purpose of estimating the cost of a single line of tramway, an item of expense which must be compratively small in going over a country which is described as being as level as a billiard table. The principal features of this coal-field, as far as it has been examined, consist in the great depth of some of the coal-beds and the facilities which it presents in a long escarpment for getting the coal by open quarrying. A second coal-field lies away some hundred leagues to the north, near Porto Alegre, the capital of the province. A third coal-field has been discovered in the small province of San Catharine, lying N.E. of Rio Grande do Sul; it is reported to be a deposit of about 80 square miles, and lying far from the coast in a range of hills. It appears not to be so readily got at, nor is the coal so good and abundant as it is in the greater deposit of Candiota. These are the first instances of coal having been found and examined in the great empire of Brazil, with its three millions of square miles of country. It is a most valuable thing to the Brazilian Government, who annually import for gas and steam purposes 250,000 tons of coal at 49s. per ton. The Brazilians, if they are wise enough to open these fields of coal, will be enabled to supply themselves with coal at 18s. per ton, and also to form a profitable depot for the supply of the great ocean steamers to India, China, and Australia. It seems to be a bituminous coal and well adapted for steam purposes and smelting; it has also been successfully tested in the Rio gas works. The probability is that this is only the commencement of many discoveries of the kind in Brazil. The fears that have so recently been expressed that we shall exhaust our British coal-fields, will be very much diminished if we discover a few more coal-fields like these in South America. The latest advices by the recently-arrived Brazil mail report that the explorations of the coal mines at Candiota, Jaquaro, and Chico, had, in every instance, confirmed the statements as to the extent and richness of the beds.

Jute.—The supply of the better qualities of this fibre continues limited, and prices have advanced, but with common the market is superabundantly supplied. The stock in London and Liverpool at the close of last month was 12,259 tons, and there are also 51,412 tons afloat,

or more than double the quantity at sea this time last year.

Exports of Furniture.—The value of the exports of cabinet and upholstery wares of British manufacture has averaged during the last five years about £270,000. Last year it was £302,016; in 1862, £259,156. The largest quantities sent to particular localities were, to Australia, £82,000; to the Channel Islands, £37,000; to the Cape and Natal, £27,500; India and Ceylon, £17,000; China and Hong Kong, £17,300.

Ivory.—The quarterly sales in London in February comprised 100 tons, of which about 45 were East Indian. The whole met with good competition. The large teeth realised an advance of £2 to £4; cut hollows £1 to £2; and scrivelloes, 10s. to 20s. per cwt. in comparison with last sale's rates; cut pieces for billiard balls, and ball scrivelloes, went off steadily, and in some instances higher.

Tanning Materials.—The imports of foreign oak bark into London last year were 1,520 tons:—of Mimosa, or Wattle bark, 2,940 tons; of Valonia, 7,160 tons; of Terra Japonica, or Gambier, 7,000 tons; and of Cutch, 862 tons.

Colonies.

Sierra Leone.—A committee of gentlemen, presided over by the governor, have decided upon holding an industrial Exhibition here, of native art, manufactures, agriculture, live stock, and African produce of every kind, at the end of the year. Such exhibitions have been considered very effective in Liberia, and if the colonists of Sierra Leone can be thereby stimulated to a healthy emulation, something like a development of the natural resources of the colony may speedily take place. At present coffee is quite wild, in the bush, but not thought of. The sugar cane, arrowroot, ginger, the ground nut, and every kind of fruit and vegetables would flourish in abundance, if the natives would till the ground and give it even common attention, but they will not, preferring to idle their time away in useless absurdities. Sierra Leone is the great nucleus of education and intelligence in Western Africa, and if she once really casts off her industrial sloth, agricultural industry will be stimulated in all our colonies, posts, or settlements, on that coast. The African Aid Society, of London, has set on foot a subscription to assist this scheme, and £400 has already been raised in the colony, but £1000 was wanted to carry it out effectually.

The Pacific Steam Route to Australia, which has been so often agitated, is at last to be carried out, the Intercolonial Royal Mail Steam-packet Company having undertaken the contract with the New Zealand and Australian Governments, commencing from Panama. The voyage thence to New Zealand and Sydney is stipulated to be made in thirty-seven days, but is expected to be performed in thirty-five, so as to bring the course of post between Australia and England within four months. By Panama New Zealand is 2,000 miles nearer to England than by the present overland route, and 4,000 miles nearer than by the Cape of Good Hope.

Australian Wool.—The progress of the occupation of sheep farming and the rate at which the flocks have increased and spread throughout the Australian colonies is remarkable. In 1810, when Germany and Spain were the only countries producing merino wool, Australia exported its first bale of 160 lbs.; but in 1860 it sent to the mother country not less than 60,000,000 lbs., of which the Germans were large purchasers. There was in 1810 an experimental clip of 160 lbs.; in 1820 the export had reached 99,415 lbs.; in 1830, 1,967,309; in 1840, 9,721,243; in 1850, 39,018,221; in 1860, upwards of 57,000,000; and in 1863, the largest return, 76,000,000. Great as has been the increase throughout Australia, the progress in Queensland has been more rapid than any other portion of the colonies. The mildness of its climate and the richness of its pastures have contributed to this result while the wool produced there realises the highest price in the London markets.

Railways in New Zealand.—The Moorhouse railway tunnel was lately thrown open to public inspection. The length of the excavation is 2,102 feet. A brick lining, 5 bricks thick, extends the whole length of the soft ground, a distance of about 150 yards. The tunnel was visited by 2,000 persons.

New Zealand Cottage Building Company.—A meeting of gentlemen interested in the project of building cottages, for the better accommodation of the labouring classes, was held on the 11th January, at Canterbury. They reported, as the result of their inquiries and calculations, that the average cost of seven detached cottages, of from three to six rooms, to be erected in the neighbourhood of Christchurch, would range from £300 to £500 per pair. The land is to be obtained within the town belt, in the town reserves, at prices varying from £300 to £500 per acre. The committee recommend that a company be formed, with a capital of £15,000, of which £5,000 be invested in building twelve cottages, of three rooms each, at £300 per pair, on one acre of land costing £400, and twelve cottages, of four or five rooms each, at £400 per pair, on one acre of land also costing £400. These cottages would let respectively for 12s. per week, and £40 per annum. The committee also recommend that a lodging house for single men should be erected, at a cost of about £2,000, accommodating about 30 or 40 persons, each of whom would have a separate bed room, with the use of a dining hall and reading room.

The Imports into Vancouver Island during the year 1863 amount in value to 3,523,053 dols. Of these goods to the value of 1,880,117 dols. came from San Francisco; from England, 1,432,521 dols.; from Oregon, 100,604 dols.; from Puget Sound, 242,781 dols.—the remainder from China, Sandwich Islands, &c. Compared with the year 1862 there was an increase of importations from England to the amount of 738,243 dols.; from Portland, 33,234 dols.; from Puget Sound, 17,988 dols.; but there has been a falling off from San Francisco of 464,949 dols. The total diminution of imports from America amounts to 413,727 dols. The total increase of imports from all sources for the year 1863 amounts to 250,273 dols. During the year 1863 there were exported from Victoria to British Columbia, goods to the amount of more than 2,000,000 dollars. Within the last six months Vancouver Island has sent to San Francisco merchandise to the value of 143,879 dols.; to Puget Sound, 46,175 dols.; to Oregon, 9,357 dols., and 348 dols. to other American settlements, making, in all, for six months, 200,761 dols. Of the 3,500,000 dols. imported into Victoria, about 2,500,000 are re-exported. Every white person appears to consume about 115 dollars-worth of imported goods annually, two-thirds from or through America. The yield of the gold mines of British Columbia during 1863 was about 5,000,000 dols. About 22,000 tons of coal were taken out of the mines during the same period. Victoria is assessed at 5,000,000 dols. Many lots sold in 1858 for 200 dols. now realize 20,000 dols. Mining flourishes, agriculture languishes. About 1,100 vessels entered Victoria harbour during 1863, tonnage, 171,777—half British—the rest chiefly American.

Emigration to Australia.—A Launceston paper says:—"The chief thing that appears to be wanted is additional hands to fell the forest, clear the scrub, and till the soil. No system of immigration yet devised has proved equal to the supplying of the requirements of the colonies. The attractions of gold have lured many from abroad, but a considerable percentage of these immigrants constitute a floating population that flocks from one gold field to another, but never settles down to steady industry. Hitherto the plan adopted has been to sell the public lands, and apply part of the profits to immigration, which has

thus been carried on by fits and starts. In many cases the immigrants have not been of a desirable character, and eventually, from a restless disposition, have left the colony at whose expense they were brought out to Australia. It appears, however, that a much less expensive plan could be adopted, and one which would not only secure a superior class of immigrants, but would fix them to the soil, and ensure the gradual settlement of the country. It simply consists of surveying blocks of land into, say twenty-acre sections, with a road frontage, and immediately behind sections of the same size, to which a presumptive right should accrue to the occupants of the road. If these allotments were numbered and reserved exclusively for selection in England the desire of possessing a freehold is there so strong that many with some means and young families would be induced to avail themselves of the same. Every person paying his or her passage should be entitled to a twenty-acre section, with the right of purchasing other twenty contiguous acres at a moderate price. If some such method were adopted Australia might be colonized more quickly than in any other way, without any risk to the several governments, and with the certainty that the immigrants would be of a superior class and would become attached to the soil."

Obituary.

John Lawton, principal partner in the well-known firm "the Executors of the late George Lawton," woollen manufacturers of Micklehurst, was born in Mossley, and at an early age evinced a degree of intelligence as remarkable as it was unusual in boys of his years. He was gifted with a retentive memory and observant mind. His advancement in intellectual studies was both rapid and satisfactory. He became a staunch promoter of mechanics' institutions, and of every other kindred society that had for its object the social and moral as well as mental advancement of the working classes in his neighbourhood. Ere he had attained his majority his father died, but so much confidence had he in his son's ability, that, some time before his death, he unhesitatingly placed the chief management of the business in his hands; and those who have marked the progress which has attended that important manufactory know how truly just was the opinion which the dying father formed of his youthful son. "Young Lawton," as he was called in the markets—for he was a mere boy at this time—not only bought the wools, a business which required the nicest judgment combined with great caution, but he also, aided by his brother's more practical experience, superintended the manufacture of them into flannels, and finally he sold them; so that in fact, he performed successfully the duties of three individuals, and continued to do so till within a short period of his death. The breaking out of the American war, which closed so many cotton mills in Lancashire, presented a favourable opportunity for the display of that Christian charity which formed a marked trait in the character of Mr. Lawton, and he at once, with the ready concurrence and assistance of the other members of the firm, engaged as many hands as he could find room for—working their mills night and day. He died on the 8th of October, 1863, in the 28th year of his age, and was interred in the family vault in the church of his native village. He was elected a member of the Society of Arts in 1862.

Notes.

A Bridge over the Straits of Messina, according to the Italian journals, is in contemplation, for uniting Sicily to the main land. The bridge proposed would be a suspension one, on a new system, the chains being of cast steel, and strong enough to support the weight of several railway trains.

Improved Dwellings for the Labouring Classes.—The corporation of London has authorized the expenditure of nearly £30,000 in the erection of a number of improved dwellings for the labouring poor in Clerkenwell, on the plan lately adopted with great success in a crowded part of Finsbury, by Mr. Alderman Waterlow. Having regard to the demolition of houses in the City, chiefly occupied by this class of the community, caused or threatened by various public works and railway undertakings in progress or in contemplation, the corporation have determined to make an effort to compensate them for their loss, and to assist them to obtain healthy separate homes, and that without overtaxing their means or compromising their independence. Acting under a power conferred upon them by the Clerkenwell Improvement Act, they now contemplate the erection, on a plot of vacant ground on the west side of Farringdon road, of three separate blocks of buildings fronting Farringdon-road and Ray-street, at an estimated cost of £28,600. Accommodation will thus be provided for 160 families, 80 of them having three rooms, and 80 having two rooms each, with all suitable conveniences. In the general arrangements every care will be taken to ensure the domestic and family comfort of the occupants, and by having a direct access from the street to each set of rooms the privacy of distinct dwellings will be secured. The basements of the various blocks will be used for warehousing purposes, and the ground floor as shops. They are of opinion, however, that dwellings of this class should under no circumstances wear an appearance of exclusiveness, but should harmonise to some extent with the general character of the surrounding property. A design for the buildings has been approved by the Common Council, and the erection of them will be commenced forthwith.

Cambridge Local Examinations.—By the sixth annual report on the Examination of Students not members of the University, it appears that the local examinations were held last December in the fourteen places in which they were held the previous year, and also at one new centre in England, namely Torquay. But the most remarkable circumstance connected with the last examinations was the extension of them to the colonies, by the successful examination of ten candidates at Trinidad. This success has been owing to the removal of all the difficulties which might have arisen in communicating with so distant a centre; partly by the great assistance rendered by the governor of the colony, and the gentlemen he appointed to superintend the examination; and partly by his Grace the Secretary of State for the Colonies, the Duke of Newcastle, who permitted the examination papers to be sent in sealed parcels to the Governor through the Colonial Office. The whole number of candidates entered was 629; 514 juniors, and 115 seniors. This number of juniors is 57 more than the number last year, and 133 more than the number in 1861. The increase over last year in the case of the seniors is 8, 7 of whom are accounted for as the candidates at Trinidad. The increase of the juniors, however, is not owing to the new centre, Torquay, for this centre only just makes up for the diminution of the number at Exeter and Plymouth; it is rather due to a decided increase at Bristol and Cambridge, and also to a small increase at most of the other centres, except at London and Sheffield, where there is a slight decrease. There appears to be a slight increase in the total number of both seniors and juniors who have passed the examination, but the per centage of juniors who failed in the preliminary part of the examination, which has for two years been 11·1, is this year 18·6, and the percentage of seniors is double that of last year.

Education in France.—The French Government has during the last few years made most laudable endeavours to extend the benefit of education, and to raise the character of the public schools, and the present Minister

for Instruction seems to surpass his predecessors in his endeavours to carry out these important objects; the common schools, those for instruction in matters relating to the fine and industrial arts, and those for technical training have all in turn engaged his attention, and have been benefited thereby. A bill has just been presented to the Corps Legislatif for the organization of what is there called special secondary education. According to the terms of this draft law, the instruction to be given in future in schools coming under the above head, and being dependent on the minister of public instruction, will include the following subjects:—Moral and religious instruction, the French language and literature, living foreign languages, history and geography, the outlines of legislation and of industrial, rural, and sanitary economy, applied mathematics, physics, chemistry, and natural history, with their application to agriculture and industry, commercial arithmetic and book-keeping, lineal and ornamental drawing, imitative art, vocal music, and gymnastics. The progress that has been made in England of late, especially in artistic and middle-class education, has attracted great attention in France, and several Imperial commissioners have crossed the Channel and made careful inquiries into the systems in operation and he results obtained therefrom, and it is evidently important that the friends of education in Great Britain should study with attention the course which is being adopted by our nearest neighbours, and the progress that is being made by them in such matters. The minister has also just appointed a special commission to inquire into the condition of musical education, and to draw up a scheme for accommodating it to the system of instruction. The commission consists of M. Bavisson, Inspector-General of the University of Paris; Félicien David and Laurent de Bille, composers; M. Marmontel, professor of music at the Conservatoire; Georges Haine, conductor at the Opera; with the secretaries of the Minister of Public Instruction and of the President of the Corps Legislatif.

South Kensington Museum.—The following is a comparative return of the visitors during Easter week for seven years, from 1858 to 1864, all the days being free days:—

	Monday.	Tues.	Wed.	Thurs.	Fri.	Sat.	Total.
1858	6,151	3,046	1,219	988	1,614	2,200	15,218
1859	5,000	6,367	2,933	1,809	2,516	1,393	20,020
1860	9,648	7,635	4,107	3,527	1,705	1,486	28,108
1861	7,100	6,017	3,205	2,845	2,662	3,090	24,919
1862	16,332	5,959	5,275	4,328	2,703	4,451	39,048
1863	7,322	5,078	1,589	1,603	1,483	3,001	20,076
1864	8,559	5,983	2,235	3,032	2,402	5,307	27,518

Acclimatisation Society of Great Britain.—A meeting of this Society was held on Monday, the 4th of April, in the Great Room of the Society of Arts (lent for the purpose by the Council), when several papers were read on the productions of the various animals, birds, fish, and plants in the colonies that could be acclimatised in this country. Mr. Higford Burr occupied the chair. The first paper was by Mr. Frank Buckland, "On the Reports received from Hong Kong, Labuan, Tasmania, and Western Australia, relating to Fauna and Flora, suitable for Acclimatisation in Great Britain." Mr. Lowe, the joint secretary of the society, then read a paper on the culture of oysters. He traced the history of the oyster from the times of the Romans, and referred to the history the elder Pliny had written of the habits of that fish. If anything were necessary to prove the importance of cultivating the oyster, it would be found in its market value. Two years ago they were worth 40s. per bushel, and now they fetch 70s. per bushel. Common oysters, which fetched 12s. to 16s. a few years ago, were now from 18s. to 24s. The price of natives used to be 4d. per dozen, but they were now 6d., 8d., 10d., and in some places 1s. per dozen. He then gave some very interesting details respecting the oyster, and urged that many miles of our coasts which were now unproductive would make admirable oyster beds. Mr. Arthur Crichton read a paper "On the Game Birds and Animals of Canada," which led to a short discussion; after which votes of thanks were given to the gentlemen for their valuable papers, and the proceedings terminated with a vote of thanks to the chairman.

Correspondence.

Artificial Lighting.—The observations I made in the discussion on Mr. Paul's paper, on the 1st inst., were in reply to his statement—"It was a mistake to suppose that petroleum had an advantage over coal gas in producing less heat, for the production of heat as well as of light depended upon the amount of carbon; the more light the more heat;" "for a given quantity of light they must have a given quantity of carbonic acid and a given quantity of heat." There appears to be a misapprehension of the generally received theory of the correlation of physical forces in these assertions; a definite quantity of force will no doubt be given out in the formation by combustion of a certain quantity of carbonic acid, but the following table, from Dr. Frankland's lecture at the Royal Institution, in February 1863 (on which my remarks were founded), shows that this force may be given out in largely varying proportions of light and heat. In connection with the subject under discussion, the table may be otherwise interesting to some of your readers who may not have seen it. It shows the amount of carbonic acid and heat generated per hour by various illuminating agents, each giving the light of 20 sperm candles:—

	Carbonic acid.	Heat.	Cost. s.	d.
Tallow	10·1 feet	100	2	8
Spermacetti	8·3 ,,	82	6	8
Wax	8·3 ,,	82	7	2½
Paraffin	6·7 ,,	66	3	10
Coal gas	5·0 ,,	47	0	4½
Cannel gas	4·0 ,,	32	0	3
Paraffin oil	3·0 ,,	29	0	5
Rock oil	3·0 ,,	29	0	6½

It will thus be seen, at least according to Dr. Frankland's experiments, that for exactly the same amount of light, tallow emits nearly four times as much heat as paraffin oil, and more than twice as much as coal gas.—I am, &c., W. Symons.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

32. Bill—Summary Procedure (Scotland),
    Barracks and Hospitals (Mediterranean Stations)—Report on the sanitary condition and improvement thereof.

Delivered on 5th and 7th March.

19. Railway and Canal, &c. Bills (66. Glasgow and North British Railway; 190. Aldborough Pier and Railway; 191. Downs Docks; 192. Forth Bridge Railway; 193. Mid Wales Railway; 194. Neath and Brecon Railway (Extension, &c.), (New Lines, &c.)—Board of Trade Returns.
14. Metropolitan Board of Works—Account.
56. Established Church, &c. (Ireland)—Returns.
83. Charitable Estates and Trusts Acts—Return.
96. Colonel Crawley—Copy of the Proceedings of the Court Martial.
59. Railway, &c. Schemes (Metropolis)—Report of the Engineer of the Metropolitan Board of Works.
97. Colonel Crawley—Copy of an order or Memorandum.
98. Colonel Crawley (Expenses of the Court Martial)—Return.
101. Dr. Turnbull—Copy of Letter.
62. (1). Committee of Selection—Second Report.
24. Bills—Weights and Measures (Metric System).
33. ,, County Franchise.
42. ,, Metropolitan Subways.
    New Zealand—Further Papers.
    North America (No. 3)—Correspondence respecting the "Alabama."

To Correspondents.

ERRATUM.—In last number, p. 318, col. 1, line 6, of Dr. Marcet's speech, for "less carbonic acid," read "more carbonic acid."

MEETINGS FOR THE ENSUING WEEK.

MON. ... Geographical, 2½. 1. Mr. Arthur J. Scott, "Overland Expedition from Port Denison to Rockingham Bay (Queensland)." 2. Communicated by Sir George Bowen "Proposed New Settlement at Cape York." 3. Rev. Julian Moreton, "Geography of Newfoundland."
Medical, 8½. Dr. Salter, "On Tracheal Dysphagia."

TUES. ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Continued discussion upon Mr. Phipps, Paper, "On the Resistances to Bodies passing through Water;" and, time permitting, Mr. William Lloyd, "Description of the Santiago and Valparaiso Railway."
Zoological, 9.
Syro-Egyptian, 7. Anniversary Meeting. 8. Mr. Charles E. Harle, "On the Giants of the Bible."
Ethnological, 8. 1. Dr. John Campbell, "On the Celtic Languages and Races." 2. Mr. John Crawfurd, F.R.S., "On the Early Migrations of Man."
Royal Inst., 3. Prof. Helmholtz, "Conservation of Energy."

WED....Society of Arts, 8. Dr. Morgan, "On a New Process of Preserving Meat."
Geological, 8.
Graphic, 8.
Microscopical, 8.
Literary Fund, 3.
R. Society of Literature, 8½.
Archæological Assoc., 8½.
College of Preceptors, 7. Professor Buckheim, of King's College, "On the History of Education."

THUR. ...Society of Arts, 8. Cantor Lectures. Dr. Crace Calvert, "On Chemistry applied to the Arts—Leather."
Royal, 8½.
Antiquaries, 8.
R. Society Club, 6.
Royal Inst., 3. Prof. Helmholtz, "Conservation of Energy."

FRI.......Royal Inst., 8. Prof. Abel, "On Chemical History of Gun Cotton."
Philological, 8.
R. United Service Inst., 3. Mr. Archibald Maclaren, "The Chief Features of the Gymnastic School at Chatham, and the Progress made in the Extension of the System of Gymnastic Training in the Army."

SAT......Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

Patents.

From Commissioners of Patents Journal, April 1st.

Grants of Provisional Protection.

Aerated bread—677—J. Dauglish.
Apparatus for securing furniture on shipboard—703—P. J. Riboulet and C. Lapelouze.
Brakes applicable to carts, &c. —253—R. B. Thomson.
Bristles, machinery for dragging—631—A. Smith.
Candles, manufacture of 645—W. E. Gedge.
Carding cotton, &c.—614—F. Wilkinson and W. Rossetter.
Carding wool, apparatus for—642—H. Eastwood and B. Matthews.
Cartridges—337—R. J. Cunnack.
Chimney cowls—707—H. Steele.
Climbing and elevation of weights—428—R. S. Symington.
Corkscrews—480—C. Hull.
Cupola furnaces—665—A. V. Newton.
Dining tables—649—C. R. Broadbridge.
Doors, &c., fastenings for—633—H. Hancock and W. H. Vickers, jun.
Drawing rollers—685—J. Bleasdale.
Dyeing and printing, colouring matters for—3,307—J. Dale.
Electric telegraph cables—637—F. H. Needham.
Endless travelling webs, regulating of—647—C. Anderson.
Fences—662—J. Rowell.
Fire escape—641—J. Newey.
Floor cloth—543—A. Ford.
Furnace bars—640—W. A. Martin and E. Wylam.
Gas and lamp fittings—739—F. Tyerman.
Gaseliers—653—E. Baller.
Gridiron—729—H. Desforges and E. C. Sonnet.
Guns, &c., construction of—625—G. Clark.
Guns, manufacture of—610—J. Shortridge and J. B. Howell.
Hats, caps, &c., application of leather—660—A. Geber.
Heat, apparatus for generating—721—J. Leslie.
Heating and melting iron, &c.—605—J. Clayton.
High-pressure steam boilers—643—E. Rowing.
Hoods, ventilators for—666—R. Holt.
Horse shoes—687—W. Clark.
Hot blast ovens—609—H. E. Clifton.
Hot water, apparatus for supplying—613—W. Wilson.
Iron, preserving o—695—F. Tolhausen.
Laced boots, construction of—619—W. T. W. Jones.
Lamps—644—S. Holmes.
Lubricating machinery—601—J. H. Schofield.
Mahogany chairs, manufacture of—711—J. Reilly.
Malleable shot, apparatus for manufacture of—481—C. Shaw.
Miners' safety lamps—620—F. Foster.
Motive power—630—W. E. Gedge.
Moulding—646—J. Platt and G. Little.
Mowing grass—650—B. Browne.
Ornamental paper—606—H. A. Bonneville.
Paper-hangings—658—A. N. Saleres.
Paper hangings, varnishing of—635—R. Fletcher.
Paper, manufacture of—627—R. H. Collyer.
Pens—676—J. Laverty.
Pile fabrics—673—J. Moore and W. Gadd, jun.
Portmonnaies, &c., locks for—617—C. J. Sharp.
Power looms—667—G. H. Openshaw.
Projectiles—663—H. Caudwell.
Puddling furnaces—31—J. Williams and G. Bedson.
Railway carriages, regulating gas in—615—W. R. Bowditch.
Railway carriages, roof lamps of—737—J. Strafford.
Railway springs, construction of—733—W. E. Winby & W. Wharton.
Railway trucks, apparatus for covering—673—R. Howarth.
Raising and lowering bodies—622—J. Taylor.
Raising water, machinery for—612—F. Walton.
Reaping machines—602—J. Wallace.
Relief plates—method of producing—664—B. Day.
Revolving fire-arms—624—C. E. Wallis.
Rotary engines—655—J. Empson and H. von Hartz.
Rotary steam engines—672—H. Bateman.
Sailing boats, masts for—638—J. Symes.
Scarfs—657—H. Tucker.
Scarfs, fastening of—628—E. Walton.
Ships' sounding rods—656—M. Montgomery.
Signals, marine and land—661—E. F. Ruffin.
Soap, manufacture of—632—J. H. Johnson.
Spinning frames—616—W. Cockshott.
Spinning wool, apparatus in—659—A. H. Martin.
Steam boilers, construction of—671—W. S. Longridge.
Steam ploughs, construction of—683—J. Jarman and S. Sharpe.
Steering ships, &c.—604—T. Banks.
Stoves and furnaces, smoke consuming—621—H. Simester and J. Bainbridge.
Street railways—654—T. P. Tregaskis.
Suet, machine for cutting—717—J. McMorran.
Textile matters—674—R. A. Brooman.
Tunnelling, machinery for—611—H. N. Penrice.
Ventilating hats, apparatus employed in—608—J. V. N. Bazalgette.
Vessels, propelling—516—J. Wild.

Inventions with Complete Specifications Filed.

731. A. Morel.
732. A. Morel.

Patents Sealed.

2309. R. Couchman.
2423. J. Schofield, J. Kirk, and W. Spivey.
2425. E. B. Wilson.
2429. W. H. C. Brakell and W. Gunther.
2431. J. M. Stanley and J. Stanley.
2436. B. G. George.
2437. T. Ivory.
2439. R. Pepper.
2442. E. Whitehouse.
2474. J. Wood, J. Whitehead, and T. Tetlow.
2475. J. Elsom.
2493. P. R. Jackson.
2513. J. Fowler.
2515. J. Rowley.
2517. E. P. Colquhoun and J. P. Ferris.
2544. W. Clark.
2545. L. R. Chesbrough.
2572. G. Davies.
8599. F. Bullock.
2601. C. Parker.
2694. G. F. Busbridge.
3230. A. V. Newton.
43. J. B. Elwell.
217. H. Bessemer.
218. G. Darlington.

From Commissioners of Patents Journal, April 5th.

Patents Sealed.

2438. J. Towlson.
2444. R. A. Brooman.
2446. G. Dyer.
2460. G. Whight.
2467. W. Lorberg.
2468. J. D. Dougall.
2489. D. Proudfoot.
2491. T. Hughes.
2501. W. E. Gedge.
2503. R. Aitken.
2507. G. Morgan.
2509. J. Place.
2553. H. Gilbee.
2711. W. E. Newton.
3253. W. E. Newton.

Patents on which the Stamp Duty of £50 has been Paid.

786. J. Cass.
784. J. Rattray.
819. W. Crighton and F. W. Crighton.
825. J. G. N. Alleyne.
816. J. Sickles.
820. M. H. Blanchard.
833. W. E. Newton.
877. F. Ransome.
933. R. Ransome.
829. R. A. Brooman.
832. A. V. Newton.

Patents on which the Stamp Duty of £100 has been Paid.

911. G. Lowry.
945. R. Birkin, jun., and T. I. Birkin.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, APRIL 15, 1864. [No. 595. Vol. XII.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at 8 o'clock.

April 20.—"On the Patent Laws." By Thomas Webster, Esq., F.R.S.

Cantor Lectures.

The next lecture on "Chemistry applied to the Arts" will be delivered by Dr. F. Crace Calvert, F.R.S., F.C.S., corresponding member of the Royal Academy of Turin, of the Société Industrielle de Mulhouse, of the Société Imperiale de Pharmacie de Paris, &c., on Thursday evening, at 8 o'clock, as follows:—

April 21.—Lecture IV.—Animal Fatty Matters, the various processes for liberating them from the tissues in which they are contained. Their composition and conversion into soap. Composite candles. The refining of lard. *Cod-liver*, *sperm*, and other oils. *Spermaceti* and *wax*.

April 28.—Lecture V.—Flesh, its chief constituents, boiling, roasting, and preservation. *Animal black*, its manufacture and applications. The employment of animal refuse in the manufacture of *prussiate of potash. Prussian blue.* Manufacture of artificial animal manures.

May 5.—Lecture VI.—Animal Liquids.—*Bile*, its purification and detergent properties. *Blood*, its application in the refining of sugar and the manufacture of albumen. *Albumen*, its use in calico printing and photography. *Urine*, its uses. *Milk*, its composition properties, falsification, and preservation. A few words on putrefaction.

The Lady-day subscriptions are now due, and should be forwarded by cheque or post-office order, made payable to the Financial Officer, Samuel Thomas Davenport. All cheques and post-office orders should be crossed through Messrs. Coutts and Co.

Proceedings of the Society.

Seventeenth Ordinary Meeting.

Wednesday, April 13th, 1864; Dr. Edward Smith, F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Farries, R. Spearman E., 13, George-street, Mansion-house, E.C., and 40, Basinghall-street, E.C.
Mostyn, Charles, 8, Cornwall-villas, Westbourne-park, W.
Yeats, Anthony George, Collinson-house, Effra-road, Brixton, S.

And as Honorary Corresponding Member.

Menn, Charles, Secretary of the Institute of Science, Geneva.

The following candidates were balloted for and duly elected members of the Society:—

Dircks, Henry, 16, Bucklersbury, E.C.
Gladstone, Thomas Murray, Lloyd's Proving House, West India Docks, E.
Hodson, Francis, 6, Furnival's-inn, Holborn, E.C.
Keeling, E. Bassett, 4, Verulam-buildings, W.C.
Peterson, Charles, Newport, Isle of Wight.
Slade, Jeremiah, 102 and 103, St. John-street-road, E.C.
Turner, George, Northfleet, Kent.

And as Honorary Corresponding Member.

Fowler, John Townshend, Madras.

The Paper read was—

ON A NEW PROCESS OF PRESERVING MEAT

By John Morgan, Esq., F.R.C.S.I., Professor of Practical and Descriptive Anatomy in the Royal College of Surgeons, Ireland.

Before entering on the subject of my improved method of preserving meat for navy, marine, and other purposes, it may be desirable to allude to some of the processes at present in use, which can be put under the head of—

1st. Enclosing in canisters, so as to exclude air.
2nd. Encrusting with varnish of different kinds.
3rd. Salting, whether in tanks of brine or dry salting.

As to the first, the practical result is, in a great degree, that salted provisions are preferred by the seamen, as remarked by one of the oldest and most accurate observers, Sir G. Blane,* who says "That men are very apt to tire of a long continuance of fresh provisions, but never of what is salt." The meats preserved in tins are mawkish, and taste of the metal, besides that they are costly in preparation and carriage, and not applicable for victualling on a large scale, are not capable of extempore preparation, and require expensive apparatus. If the meat be previously parboiled or soaked in water, the fluids are extracted, some of the most important nutritive elements being thus lost.

2nd. As to encrusting with varnishes—This method is imperfect, from the difficulty of thoroughly coating over the chinks and inequalities of the flesh; the risk of taint, when subjected to damp, or when any spot is exposed, are great objections, as well as the expense and labour of covering each piece, though where this is not any great object, and the materials to be preserved small in bulk, the plan might be found applicable in a financial point of view.

* "Diseases of Seamen," page 296.

3rd. As to salting. The method usually practised at all curing establishments is as follows:—After killing the animal in the usual way, it is cut up in twenty-four hours (in 8 lb. pieces if beef, in 4 lb. pieces if pork) for navy stores, rubbed with salt, and then placed in tanks of dry salt for a certain number of days—eight to twenty-one, or even more, according to judgment. A brine is formed, containing, as Liebig* expresses it, "the soup or a concentrated infusion of meat." "Also," he adds, "in salting, the albumen is separated from the flesh, as well as the phosphoric and lactic acids, potash, and kreatin, &c. It is easy now to understand that in the salting of meat, when pushed so far as to obtain the brine just mentioned, a number of substances are withdrawn from the flesh which are essential to its constitution, and that it therefore loses in nutritive quality in proportion to this abstraction. If these substances be not supplied from other quarters it is obvious that a part of the flesh is converted into an element of respiration, certainly not conducive to good health.

"It is certain, moreover, that the health of a man cannot be permanently supported by means of salted meat if the quantity be notgreatly increased, inasmuch as it cannot perfectly replace, by the substances it contains, those parts of the body which have been expelled in consequence of change of matter, nor can it preserve in its normal state the fluid distributed in every part of the body, namely, the juices of the flesh. A change in the quality of the gastric juice, and consequently in the products of the digestive process, must be regarded as an inevitable result of the long-continued use of salt meat."

The meat, now deprived of its albumen in a great degree, of its phosphoric and lactic acid supply, of its potash, salts, &c., is for navy purposes or for casked provisions, packed in barrels of large crystallised salt (St. Ubes) and pickle—a head or overplus of the salt being placed at each end. The result is, that in process of time, a still further abstraction of the nutritive material takes place; the large crystallised salt, being purer, effects this more perfectly, so that in some months the remark of Sir G. Blane and others is not, perhaps, exaggerated, "that the meat has no more nutrition than saw-dust or the bark of a tree†." "Ornaments may be cut out of the meat, resisting the knife like wood."‡

Dr. Hammond, Surgeon-General to the United States' Army, 1863, in his treatise on Hygiene, page 491, remarks, "Individuals therefore subjected to a diet consisting mainly of salted meat are not properly nourished, and hence the constitutional disturbance (which, under such circumstances, is always manifested) is due not to the direct action of the salt, but to the absence from the food of matters which are essential to the well being of the organism. It is sufficient in this place to state, that scurvy and other forms of cachexia which follow the prolonged use of salt meat, are not the direct consequences of the large quantity of salt ingested."

It is evident that by the usual process the meat is deteriorated to a very great extent, more so perhaps than is generally supposed, and that the evils attributed to the taking in of salt are not due to its action—but to the removal from the system of the constituents natural to muscle juice. It will be interesting to inquire how far this deprivation injures the meat. As remarked by Liebig ("Letters on Chemistry," page 446), "flesh by salting loses in point of nutritive value, in consequence of the removal, soluble and insoluble, of the salts indispensable to sanguification, in the same way, if not in the same degree, as that which is well boiled; of three cwt. of meat, by the full action of salt, one cwt. may be rendered useless for the vital process"; that this is the case the following analysis will prove:—

* "Chemistry of Food," page 135, Liebig.

† Diseases of Seamen, p. 442.

‡ Armstrong, Naval Hygiene, p. 30, 1858.

Of Salts.	Grains.
10 lbs. of fresh meat give $2\frac{1}{2}$ oz. or.........	662·8
10 lbs. " " exhausted by lixivation and boiling, give to the soup	544·7
Remain in the flesh only	118·1

	When boiled there enter Soup.	Remain in meat.
Phosphoric acid.........	26·24	10·36
Potash	35·42	4·78
Earths and iron.........	3·15	2·54
Sulphuric acid	2·95	
Chloride of Potassium	14·11	
	81·87	17·68

The following celebrated experiments of the French academicians amply prove that meat deprived of its soluble matters cannot efficiently support life. A dog, weighing 12lb. 6oz., was fed daily with ½lb. of boiled flesh, softened in water, thoroughly expressed and freed from fat as much as possible; he lost in the course of 43 days one-fourth of his weight; after 55 days his emaciation was extreme; he could hardly eat the fourth of his ration, and his utter exhaustion was evident to the eye; the animal continued lively, his hair was shining, and he showed in no respect the symptoms of consumption from disease, but rather looked like an animal which had good food, but in quantity far inferior to his wants. On the other hand, dogs fed daily with the same weight of raw flesh, which contained more water and less solid matter than the boiled, and of the poorest quality (sheep's heads), exhibited, after 120 days, no signs of disturbance of health, and sustained their full weight. The loss of nutritive power in the flesh was obviously caused by the removal of the ingredients of the soup—what perhaps occurs even in a greater degree in ordinary curing.

I would here subjoin, and request attention to the composition of flesh, according to Liebig:—

Reaction acid.
- Water, 76 to 79 per cent.
- Albumen, 2 to 14 ,,
- Phosphoric acid.
- Lactic acid.
- Phosphate of potash.
- Chloride of potassium.
- Kreatin and kreatinine—found in all higher animals.
- Inosinic acid.
- Fibrine, 70 per cent. of dried flesh.

Having thus shown that the deterioration of the meat is caused not by the presence of salt, which we all know is instinctively sought after, but by the taking away of the several ingredients alluded to, I propose explaining the means, mechanical and scientific, I adopt for the retention or addition of these substances, and offer for inspection and tasting by the members present the several specimens on the table, kindly allowed me by the Comptroller, cured for navy stores at the Royal Victoria Victualling Yard, Deptford, in presence of the comptroller and officers of the yard. These operations were necessarily carried on with extemporised arrangements; nevertheless, as can be testified by your secretary, amongst others, in six minutes or less the entire animal was "cured" and ready for casking, no materials being abstracted from the flesh.

In the method which I desire to bring before you preservative fluids are injected into the tissues of the meat by means of the circulation, so that every particle of the flesh is reached; these means, being already formed and used by nature, are of necessity complete and perfect, if properly taken advantage of, but this has hitherto not been done.

I shall first detail the *modus operandi* of my process. The animal is killed in the usual manner by a blow on the head, causing instantaneous death. It is then turned on the back, the chest opened, the bag or pericardium, containing the heart, opened. The right side of the heart, into which all the venous or returning blood enters, is seen distended; the ear or right auricular tip, as most

convenient, is opened, or its tip cut off, or an incision made into the right ventricle, another also directly into the left. The animal is turned on the side to let the blood run out. A pipe, furnished with a stop-cock and coupling at the outer end, is now introduced into the incision made in the left ventricle, and makes its way at once into the aorta. The fingers, holding a piece of stout cord, are now passed round the aorta, close to the heart (including at the same time the pulmonary artery), and the cord is tied strongly over both, so that the pipe is fixed in the aorta firmly. To the outer end a coupling, connected with an india rubber or other tube, three-fourths of an inch in diameter, 18 to 20 feet long, joins this to a vessel or tank elevated to the height of the length of the tube; brine of ordinary strength, with a little saltpetre dissolved in it, is let on; it directly (under fifteen seconds in most cases) rushes out at the incision made either in the right auricle or ventricle, before mentioned. About five gallons will suffice. This clears the smaller vessels for the next stage, which is the essential one. The brine so used can be recovered if desired by adding a little old brine and heating. The materials to be ultimately used are now put into the tank, taking care that they are strained, and a stout clip or clamp is put on the incision in the right side of the heart. The fluid is then turned on and directly makes its way to the right side, as before, but its exit being now prevented, and its admission into the smaller vessels being secured by the first process of clearing these vessels, as mentioned, the fluid, by the pressure and the capillary attraction of minute vessels and muscular fibre, precolates through every particle of the animal, and can be seen at the moment diffusing itself in any part, by making incisions in the hide, horn, bone, and flesh, or any other parts. The quantity I use is about one gallon of brine to the cwt., a quarter to half a pound of nitre, two pounds of sugar, a little spice, sauce, &c., to taste; also ½oz. of the mono-phosphoric acid, which, having the power of coagulating albumen and forming a compound with it, retains this very desirable element in the flesh, and gives an extra supply of phosphoric acid, which is of course at present denied the sailor, as above stated. The use of boiling brine in the second stage I also advocate, as it coagulates the albumen or gives a set (as it is called by cooks) to the meat. It is needless to remark that the entire animal is cured almost instantaneously.

I would now draw attention to the further treatment of the flesh, referring to

1st. The method scientifically used;
2nd. The advantages attained;
3rd. The mechanical advantages;

if we now consider the first part of the process complete.

The animal is in a few hours cut up into the 8lb. pieces required by the navy, and is ready for casking in the usual way, or in dry salt (all expense of preparing being done away,) or for drying by being transferred to a drying-house (as in the specimens for inspection). It is obvious that it loses none of those materials abstracted by the present method of salting, so that the meat is absolutely perfect, as in fresh meat without water, having, as I hold, the additional advantages of salt* which the weight of authority is in favour of rather than against, and of sugar, now issued to the navy, along with the lemon juice; the use of sugar Liebig shows plainly is for the formation of lactic acid, (which, as mentioned before, he has found abstracted by the brine), and a most essential compound not only of muscle juice, but of gastric juice, as well as an important respiratory food. I would suggest the use of "sauer kraut," or some other vegetable product containing lactic acid, or lactic acid itself. Sugar is, in an economic point of view, specially advantageous, as it is about two-thirds the price of meat, or less, while it improves the flavour and keeps soft the flesh, aiding also in the preservation.

* See article Scurvy, "Library of Medicine," vol. 5, page 32, by Dr. Budd.

Phosphoric acid, abstracted by the same plan, I propose to add to the meat used for the navy, to make up for the deficient vegetable supply, a material eminently useful, especially in its monobasic form, as recommended by Prof. Galloway from its various qualities of coagulating albumen and retaining it in the flesh, from its known utility in the system, as an essential in muscle juice, also for the formation of phosphate of soda in the blood, this salt performing an office essential to life, in holding carbonic acid in solution and carrying it to the lungs.* Gastric juice also contains this acid in health; it has no means of getting it from the flesh prepared in the ordinary way, but it must be supplied by vegetable substances, as by lemon juice. An analysis was recently made by Professor Galloway of two specimens of lemon juice, one bought at a druggist's, and the other supplied by the Admiralty; they were found to contain a very considerable quantity of phosphoric acid, the sample from the Admiralty giving the following results:—In one gallon of lemon juice, phosphoric acid equal to 91 grains of anhydrous phosphoric acid, and this equals 458·5 grains of ordinary phosphate of soda ($2\ NA\ O,\ HO\ PO_5\ 24\ HO$). This acid is not given in the usual tables of the components of lemon juice, nor has it, I believe, been before looked for, as the other acids contained are citric and malic in small quantity, and as these have been given medicinally with but little benefit for scurvy, it is sufficient proof that as the seaman is deprived of this important element of the body in his meat, he derives benefit from its being added artificially in lemon juice. I am here again desirous of quoting the words of Liebig with regard to this component, bearing in mind that it is found in some form

In blood
In muscle juice
In gastric juice
In bones
In nervous matter
In viscera, as liver, kidney, lungs.

He remarks ("Letters on Chemistry," page 409), "In the present state of science it is not possible to express a decided opinion as to the mode of action of the phosphoric acid in the organic process, and we must for the present be satisfied with deducing from its constant presence in all the juices and organized tissues of the body the conclusion that it is indispensable to the vital process." Muscle juice is also found to contain this acid largely, and as Liebig supposes, probably by the acidity of muscle juice and the alkalinity of blood, a modified galvanic action is kept up, preventing in health the filtration of one fluid into the other.

The potash salts found in flesh juice, and abstracted by the brine, can be added as found desirable. I have used the nitrate, but the phosphate or other forms are equally manageable.

I may be allowed here to suggest the probability of the cause of scurvy being chiefly the want of supply of the lactic and phosphoric acids as well as of the potash salts; hence the early symptoms of dusky hue of skin, breathlessness, palpitation, and symptoms of imperfect respiratory process from want of the necessary salt, phosphate of soda, in the blood, and the more early appearance of scurvy in cold latitudes, where the respiratory process should be more energetic; the deficiency of lactic acid and other elements is shown by the early muscular debility, and the endosmose and exosmose of the blood and muscle juice. All authorities agree in the altered condition of the blood, which I believe depends on the want of phosphatic supply, the action between blood and muscle juice (as alluded to above by Liebig) being abnormal, the extravasations take place from altered specific gravity and reaction, hence the solutions of bone and separation of the epiphyses in extreme cases from the avidity in the system for phosphatic supply.

* "Liebig's Chemistry of Food."

That the want of acidity of the muscle juice and altered conditions of the blood are the causes of scurvy, is also supported by the fact that "sauer kraut," molasses, wines, &c., are antiscorbutics.

The nervous depression may also be explained by the want of phosphatic supply to the nervous centres.

The retention of the albumen I attain apart from the addition in some cases of the mono-phosphoric acid, by the use of boiling brine; as its temperature is higher than that required to coagulate albumen, I diffuse it by my process, through every part of the flesh, where this material can be seen around the muscular fibres like milk. As flesh contains about one ounce of albumen in every three pounds weight, and this weight is made of 72 per cent. or more water, the advantage of retaining the albumen can be easily seen. By the retention of the albumen the meat is also kept more tender and "short," and is consequently more easy of digestion.

Its importance as an element of food cannot be overrated when we reflect on the composition of the egg, and observe that everywhere throughout organised nature where animal life is developed, we find the phenomena of life depending on its presence.

How far I have succeeded, the analyses I now give will explain: these have been made by R. Galloway, F.R.S., Professor of Practical Chemistry, Museum of Irish Industry, the meats, except the first part, being supplied by the Admiralty for analysis—though the complete investigation of them has not been concluded.

Fresh beef, about 4 years old, killed 23 hours, gave—

1.	Water	73·18
	Solid matter	26·82
		100·00

Beef cured by my method, February 2, 1864, and casked as usual—

2.	Water	56·61
	Solid matter	43·39
		100 00

Beef cured at Deptford by the usual method, February 2, 1864—

3.	Water	51·75
	Solid matter	48·25
		100·00

Per centage of albumen of meat dried at 212°—

	Per cent.		Per cent.		Per cent.
No. 1.	8·16	No. 2.	9·24	No. 3.	5·49

Shewing, that in the meat prepared by my process, the quantity of albumen rather exceeded that in No. 1. (probably from the feeding and age), and that the ordinary process lost albumen largely.

The operation, though scientific, and based on anatomical principles, is simple, and practical in the extreme; it can be learned and practised by any ordinary hand after one or two operations. No machinery is necessary beyond the pipe and stop-cock, coupling and clamp, in all costing about 12s., some tubing, and a barrel or tank. No rubbing or further manipulation is required, this being in itself a vast saving of labour and time; as, in my opinion, the sooner the flesh is put to dry, the better, and if to be casked it may be packed directly; the albumen being coagulated, and sugar being already added, (phosphoric acid if desired, but for the navy recommended) and nitre. I prefer the meat being put in dry salt, to the ordinary method, but this is nearly immaterial.

The process occupies three minutes for the first stage, and a little less for the second; the entire period from killing the animal till hanging it up flayed and disembowelled, being twenty minutes, and this by men unaccustomed to the work. The danger of taint is obviated, because the cure takes place from within out, and not as in ordinary cases the reverse.

It is allowed (I believe and am so informed) that when the meat, salted by the ordinary means, is weighed for messes, it is found to have lost in weight. By my method there is no loss, save water in the case of dried meat, and if the meat be casked, the sugar being added, the material is kept soft, and does not lose nutrition. Spices, flavorings, antiscorbutic remedies, if desired, can, with ease, be added and proportioned; the spices would, in a great measure, supply the place of salt.

A most important element in my method also is its simplicity, so that in case a ship touched at land where animals were abundant and cheap, a stock could be extemporaneously prepared of dried or casked meat. I would propose that an officer be specially instructed in the application; and weather or climate would be comparatively no difficulty—sheep, swine, and all mammalia being suitable.

I further draw attention to a fluid for preservative purposes, made of a solution of mono-phosphoric acid. The meat should be soaked some time and washed before boiling; of course it must retain all the elements natural to it.

Having thus put before you the chief features of my invention, I shall be happy to give any further information. I believe improvement is required in the meat of the sailor and soldier, as too easily proved in the late war, and specially for that much-neglected and ill-used section of society—the merchant marine, some portion of it at least. I have, I trust, succeeded in at last accomplishing a simple, efficient, economical, rapid, and scientific method of preserving meat for such purposes as are required.

The victualling department of the navy have had a number of bullocks prepared by this method, and have shipped them to various climates to test the efficacy of the process.

I subjoin a rough list of the improvements to be attained by this process:—

1. No rubbing with salt.
2. No putting in tanks of salt, or labour.
3. The operation requires for a bullock only an extra time of five minutes or thereabouts.
4. No machinery required.
5. No loss of weight.
6. Diminution of taint.
7. Cure possible in other than the winter months, when meat is cheaper.
8. Not increasing the market price by purchasing so many animals together.
9. Making dried meat containing all the nutriment without extra expense.
10. This dried meat will make soup, and
11. It can be carried conveniently.
12. Two or three days' supply would be portable (if dried) by each man without difficulty.
13. Being parboiled, or "set," it can, when dried, be eaten without cooking if need be.
14. Spices and flavours can be added economically.
15. Anti-scorbutic remedies or vegetable products likewise.
16. Applicable to extemporaneous use.
17. The hide and every part of the animal is cured at once.
18. Every part of the animal is cured so that the shins head, &c., can be used.

DISCUSSION.

Admiral Sir Edward Belcher considered this process a very valuable one, as dispensing with the severe manual labour of salting provisions by the ordinary means. As much as 70 years ago, however, meat was cured with sugar, though a different process was adopted to that described this evening. Meat had been sent from Nova Scotia to Jamaica in treacle, or cured with sugar, and it remained perfectly good. He considered Sir Gilbert Blane's idea with regard to scurvy quite erroneous. Very few persons had investigated the question of scurvy

amongst seamen more carefully than he (Sir E. Belcher) had done. For 25 years he took care of his own ship's company without the assistance of a medical man, and during that period he directed his attention to securing for his seamen everything which was supposed to tend to the prevention of this disease. As far as lime-juice was concerned, he discarded it altogether from his regimen. During one of his Arctic voyages he gave this to the men, because they were not allowed to drink the ice-water, but he believed the anti-scorbutic properties were in the sugar mixed with the lime juice, rather than in the juice itself. It was quite true, as stated by Mr. Morgan, that seamen preferred salt provisions, and that the dislike to turtle was general amongst them. An Englishman, attempting to eat turtle by itself, would be disgusted with it, however much it might be prized in this country, where it was a mere vehicle for other condiments that were added to it. With regard to Sir Gilbert Blane's idea as to drinking sea-water, if he had studied the effects of sea-water upon the human frame, he would have understood that he might have given his men as much salted provisions as he pleased, without producing disease; but if only a very small quantity of sea-water got into a tank of the fresh water used for drinking, many varieties of diseases would be produced. From experience he had had with ships' companies on the coast of Africa he found that fresh provisions with fruit added did not prevent scurvy, which prevailed to such an extent that he had to come to England for a fresh crew. That disease, in the case he referred to, he believed to have been occasioned by the men wearing damp clothing, but as soon as he discovered what he believed to be the cause, he insisted that they should be examined every night to see whether they had dry flannels on them. Scurvy, moreover, was known in England quite apart from salt provisions, particularly in gaols. When the expedition under his (Sir E. Belcher's) command was about to proceed to the North he obtained permission from the Admiralty to have a considerable portion of the provisions cured in his own way, viz., with sugar. The meat was rubbed with sugar till it absorbed it to a great extent, and a coating like varnish was formed on the surface. It was also rubbed with salt, and packed dry. He had eight casks prepared in this way in February, 1852, and in July of the same year, he gave his officers good beef-steaks from that meat. On the two following Christmas days, they had roast beef from it; and after five years and eight months, he sent a round of beef to the Admiralty, which was in good fresh condition, with good fat on it. He therefore advised Mr. Morgan to add a little more sugar to his mixture. With respect to dried meats, he would mention that about the year 1820, a method of preserving meat with pyroligneous acid was adopted. Admiral Sir Thomas Cochrane sent out a quantity of provisions so prepared to Barbadoes: and two years after he (Sir C. Belcher) ate some of that meat at the admiral's table at Bermuda. He, however, strongly approved of the sugar curing, because it preserved the juices of the meat better than any thing else. With regard to the necessity of meat as a food in hot climates, he would remark that in the islands of the Pacific the natives did not eat meat at all, and if they did so they were visited with violent cutaneous eruptions. The Admiralty were so satisfied with the superiority of the sugar process that on his (Sir E. Belcher's) return in 1854, they applied to him for his recipe, but he was not aware that it had ever been used in preparing the navy provisions since that time. With respect to the remarks as to the inferior victualling of the merchant marine he could not agree with Mr. Morgan, his (Sir E. Belcher's) opinion being that the meat supplied to the merchant seamen was superior to that which they got in the royal navy. In conclusion he would say he fully appreciated the value of this process, but he strongly advised Mr. Morgan to store the meat in dry salt instead of wet pickle.

Sir Joseph Paxton, M.P., was quite sure the meeting must have been exceedingly gratified at the very able manner in which this subject had been treated by Professor Morgan. He (Sir J. Paxton) had not looked at it quite in the same point of view as the gallant gentleman who had just addressed them, but he had regarded it more in a commercial and sanitary light. This was a subject of much interest, and there was a bill now before Parliament with respect to the examination of meat unfit for human food, but the question was so difficult to deal with that he believed Parliament would be able to do little in the matter till they were better informed on the subject. It struck him that this ingenious process would enable persons in distant parts of the world to send meat to this country, in very large quantities, in a better state than hitherto we had been accustomed to receive it in London from the more distant parts of England, and probably it would be found better for us to import meat from different parts of the continent cured in this manner, than for the cattle to be sent alive, causing in many instances a great amount of suffering to the animals in the passage, as well as injuring the quality of the meat. Regarding the present very high price of meat in this country, he looked to a more extended field for the supply of that article, and it appeared to him that it was only by the application of the increased chemical knowledge of the present day that we could hope for an adequate supply of meat to be brought to this large consuming market. In some parts of South America cattle were slaughtered to a large extent merely for the sake of their hides, while the disposition of the rest of the carcase was a matter of serious difficulty. Seeing, therefore, that the length of passage by steamer would not be more than about a month, a process by which not only the hides but the meat could be made available for our market would be most valuable in every point of view. Although this process might not be new as regarded the materials employed, yet the mode of their employment was so, and the effect appeared to be remarkably satisfactory. He had no doubt a little more sugar would do no harm, and there was no difficulty in adding that if it was found to be wanting. He could not but tender to Professor Morgan his cordial thanks for the admirable way in which he had introduced and illustrated his subject.

Mr. Winkworth said that he did not rise to enter into the discussion, but to ask a question of Professor Morgan, which was suggested to him by something which had fallen from Sir Joseph Paxton. He wished to inquire whether the process had been tested in tropical climates. He asked this because it was known that in some parts of South America, and elsewhere, cattle were bred solely for the purpose of curing and transmitting the skins to Europe, as a valuable article of commerce, while the denuded carcasses were left to birds and beasts of prey, or otherwise disposed of, but not always in time to prevent that offensive decomposition which must immediately ensue in such hot countries. Even in other remote spots, such as the Falkland Islands, which enjoyed a temperature similar to our own, the sparseness of the population, and the impossibility therefore of disposing of the meat, rendered the application of a process of preservation like that which Mr. Morgan had brought so graphically before the meeting, most important.

Dr. Bachhoffner said, although the process could not be regarded as a new discovery, he believed it would be most valuable. Some years ago Mons. Gannal, of Paris, introduced a process of embalming effected in a somewhat similar manner to that described by Mr. Morgan. It was true that the one was for the preservation of a dead body—the other, the rendering of a carcase palatable. The materials used by M. Gannal were poisonous, but they rendered the body incorruptible. In the process exhibited to-night, he thought there were certain points which required a little more explanation. In the first place, with regard to the "washing out," it was a question whether they were not taking away valuable substances which nature had supplied. This "washing-

out" was very much like bleeding an animal to death, by which they lost much of that nutritious matter which otherwise would remain in the carcase. Then, again, there were introduced certain saline matters, not so much for the sake of preservation as to add that of which it was alleged Nature gave an insufficient supply, such as phosphoric acid, &c. As regarded the sugar which was to furnish the lactic acid he could not conceive that by introducing sugar into a dead carcase it could be converted into lactic acid. That was a result produced only in a living body. It would answer as well to eat the sugar apart from the meat. He remembered a few years ago a patent was taken out for the preservation of meat at Barbadoes, where it was required to be eaten very soon after it was slaughtered. That process consisted in forcing brine into the meat, after it was cut up, by hydraulic or pneumatic pressure, but it failed. By Mr. Morgan's process, however, the brine was introduced into every part of the flesh in the most perfect manner, but with respect to a portion of the ingredients injected, some people might prefer to have the meat in a state more allied to its natural condition. He believed this process to be a most valuable one, and he hoped it would relieve seamen from the necessity of eating such strongly salted provisions as they were now often compelled to consume. He had seen "salt junk" so hard that when it was polished it looked almost like mahogany. With regard to preservation in tins, he had tasted meat that had been preserved for twenty years, but he did not consider it palatable.

Mr. John Bethell said that about twenty-two years ago a patent was taken out in which a process was described which appeared to be very similar to that which had been just brought before them. He knew himself that sheep had been thus prepared in Smithfield, and a great deal of trouble was taken by persons interested to introduce the process commercially, but it failed—for what reason he did not know. He agreed with those who had preceded him that this process was most useful, and he should be sorry to say one word derogatory to it. He agreed with the last speaker on the subject of the "washing out." He imagined the intention was to wash the remaining blood out of the veins, which was similar to bleeding to the last drop. He believed it was considered that that injured the nutritious qualities of the meat very much, and he should not have thought there was any necessity for it. He thought the vessels might be impregnated with the saline matters or sugar in solution without getting rid of the blood. Some years ago it was advanced that the meat would be better if the animal were killed without bleeding; death by suffocation—by puncturing the chest and pumping in air so as to compress the lungs—was recommended. He thought it would be a great benefit to sailors if this system were introduced. He was perfectly aware of the difficulty there was in getting the Admiralty to move in matters of this kind, having himself, during the Crimean war, introduced a process of preserving meat in small pieces, dried at a temperature below that at which the albumen was coagulated, and when soaked for a time in cold water the original properties of the flesh were restored. Some of the meat so prepared was sent out to Africa, but it was said the sailors did not like it, and the process was not continued.

The Chairman said the meeting could not fail to have been interested and much instructed by Mr. Morgan's admirable paper and the discussion upon it. Some present might not be aware that the Society had offered a large prize for the best method of preserving meat, &c., and the communications sent in on that subject remained to be referred to a committee to decide upon, and the Society did not commit itself the merits of any process—the process now before them—or any other. It was necessary that they should keep the practical part of the paper separate from the speculative. He thought it was the former that this Society had more particularly to deal with. The theories advanced by Mr. Morgan as to the causes and prevention of scurvy might be correct or not, but the discussion of them would hardly be desirable on this occasion, as they did not affect the merits of the process. A question had been raised as to what they should introduce into the flesh as the curative material. He had no doubt sugar was a good preservative, and it was commonly used for the best hams and bacon. He thought that with regard to the effects of the ordinary salting process, Mr. Morgan was borne out by scientific facts. If meat were salted in the ordinary way there was no question that a large portion of the fluids was extracted, while salting from the inside, as practised by Mr. Morgan, preserved most of the nutritious juices of the meat, although when cut up into joints a certain portion of those juices would no doubt exude. With reference to the phosphates he considered they were important, as they were found in nearly every description of food, and to persons in a position to obtain a sufficient quantity of mixed foods the natural supply of phosphates would be sufficient, but the cases now in question implied circumstances in which a mixed diet could not be obtained. Then it became a question whether a small artificial admixture of phosphates was not an advantage. He was struck with the importance of this process in connection with the importation of foreign meats into this country. No less than 2,000,000 of cattle were said to be slaughtered annually in South America, for the sake of their hides and hoofs alone. He was not certain whether even the fat was made use of. Therefore, in a commercial point of view, this process promised well. Meat was greatly wanted in this country at a less price than it could now be obtained. The great question was what would be the future of this process. He apprehended as yet sufficient time had not elapsed to test it thoroughly, and they had to find out by experience whether it was as efficient in preservative power as the system at present in use. With reference to the bleeding he confessed, consulting his personal feelings in the matter, he approved of the Jewish mode of slaughtering, by cutting the throat and bleeding, and no better meat than that killed on the Jewish plan could be obtained. He was quite sure the meeting would authorise him to tender to Mr. Morgan their grateful thanks for his very interesting paper.

Mr. Morgan, in replying upon the discussion, said with regard to what had fallen from Sir E. Belcher, he had not brought forward the process of curing with sugar as a new thing. He would prefer a larger quantity of sugar: but even 10 or 12 lbs. of that article as applied by him, was rather an innovation as far as it went. He was quite aware that meat had been preserved for a very long time either in treacle or glycerine, both being materials which excluded the air. With regard to Sir Gilbert Blane, he had referred to him merely as a practical man, and an old authority on the subject of scurvy, which he believed was only another name for a certain degree of starvation. As to the effects of drinking salt water, Sir E. Belcher had correctly described the symptoms of men dying of thirst, which proved that the blood refused to take an amount of saline matter beyond its natural constituents. If a number of glasses of water were taken by a person at short intervals, the kidneys would secrete the water in the proportion in which it was taken, but if salt to even a small per-centage were added, after the second or third glass the stomach revolted at it, and the blood refusing to take it in, the effects mentioned would be apparent. With regard to damp clothing, it was injurious, inasmuch as it interfered with the respiratory powers of the skin, which was, in fact, a great lung. With regard to the question of removing the blood, he confessed he was not an advocate for keeping this in the carcase. The Jews might be regarded as great flesh-eaters, and, consequently, a vigorous and enduring race, and under the Levitical law they were forbidden to eat the blood, and under thier system of slaughtering animals for food great care was taken that all the blood was extracted: therefore, according to the Divine authority of the Levitical

law, which at least must be admitted as eminently hygienic, he considered the blood ought not to be retained in the meat, seeing it was inculcated from the time of Noah, to the "necessary things" of the Apostles. Such a practice certainly would not be favoured by butchers themselves, because the blood was a great decomposing agent, and remaining in the vessels would disgust the consumer. They must also recollect that a diseased condition of the blood must first be supposed to exist before its effects were seen in the system, and even the mode of death altered its condition and possibly even composition. On the question of the quantity of blood in an animal, he believed very erroneous notions were entertained. In the sheep which they saw before them they had seen that before a quart of the fluid had been injected by his process, it began to issue freely out of the opposite side of the heart. It had been said that the human body contained about 26 lbs. weight of blood. If that were the fact, a person would hardly be affected with fainting on losing 10 or 12 ozs. of blood; yet such was usually the case. He hoped on every ground that the blood would never be retained in meat used for food. As to the temperature at which the drying process was effected, Mr. Morgan pointed out some specimens which had been dried in the biscuit loft over the bakery at Deptford, at a heat from 104° to 120°. In dividing the carcase for drying, discretion should be used as to the size of the pieces and the temperature; if the pieces were too large or the heat too great, before the water could be given off decomposition would set in. He hoped to see a larger use of dried meats than was now the case, as they presented so many advantages. With regard to the application of this process in very hot climates, he would mention that an agent had been sent out to practice this method of preserving meat in Monte Video, and he hoped soon to see some satisfactory specimens. With reference to the preservative process of M. Gannal, mentioned by Dr. Bachhoffner, it consisted of the injection of poisonous materials, and of chloride of aluminium, by means of a force-pump, through one of the large blood vessels of the neck, which had the effect of slowly mummifying the dead body. Of course, where poisonous solutions could be used, there was no difficulty. In reply to the speaker who suggested that the quality of the meat might be deteriorated by the ingredients used in the curing, he wished it to be understood, that he used those materials which were ordinarily employed in curing meats, and he preferred to use them in a boiling condition, because this caused the albumen to "set" at once, which had the effect of making the meat more tender when eaten, and preserve better. He did not say it was essential to "doctor" the meat, though he believed the addition of a certain small proportion of phosphoric acid was of great importance, for seamen who could not, under ordinary circumstances, be supplied with the requisite amount of that material to be derived from other articles of food. As to the preservation of meat with sugar, if they used sugar alone, the expense would be very great, and Barbadoes would not supply enough for the large scale on which the curing was carried on at Deptford; but he thought there was an advantage in using sugar as an ingredient, to the extent or even more than he suggested. With regard to the objection that his plan was not new, he would say he had paid some attention to the different methods that had been adopted, and amongst others, to that of Mr. Long, to which he believed Mr. Bethell referred. The plan of operation in that case was to fill the vessels with forcing machinery, introduced into the ventricle of the heart of the animal, and this to be held by a man's hand, and that as soon as the fluid flowed back the operation was complete; but he questioned whether any four persons in the room could, with their hands round the ventricle of the sheep before them, hold it so as to inject all the arteries and capillaries in the way he had done this evening. He held it to be a totally different process to his own. There were not two openings made in the heart, or two stages; the theory and principles were not the same. Injection for subjects for dissection had been practised for more than a hundred years, but the process alluded to was merely a bad and unskilful way of doing it.

Mr. BETHELL said he referred to the plan of Mr. Perks.

Mr. MORGAN believed that to have been Mr. Long's patent. One argument in favour of his (Mr. Morgan's) plan as against that mentioned by the speaker, was. that the latter was admitted by him to be a failure, whereas his was not. He hoped before many months were past they might have meat from South America and at home of good quality and at a cheap rate.

The author illustrated his process by showing its application to a sheep recently slaughtered. A bucket of brine was raised to a height of about twelve feet, and a tube connected with it inserted into the heart of the animal, as explained in the paper. The vessels were thus washed out, and the preservative fluid was then injected, the whole operation occupying but a few minutes. Specimens of meat prepared by this process, that had been kept some months, were on the table, and were tasted by many of the members.

Proceedings of Institutions.

CHATHAM, ROCHESTER, &c., MECHANICS' INSTITUTE.—The twenty-seventh annual report states that the receipts from ordinary sources have considerably exceeded the expenditure, and that a very large sum besides has been realised by the reading given by the President, Charles Dickens, Esq., to whom the committee take this opportunity of returning their very sincere and heart-felt thanks. But for the generous aid which has been rendered on former occasions, there is little doubt that the Institution must have been closed long since; his name has given to it a prestige which it could not otherwise have obtained; and the profits derived from his readings have enabled former committees to meet their heavy responsibilities, to add from time to time largely to their library, and in other ways to maintain the efficiency of the Institution. They purpose devoting a sum of about £50 out of the £73 derived from Mr. Dickens' last reading to the purchase of new books for the library, deeming it most prudent to keep a portion in reserve for future contingencies. During the past year the number of volumes issued has been 4,396, being a considerable increase on the issue of the year before; and there have been added during 1863, nearly a hundred volumes of popular works, and bound and repaired about 80 volumes, a great part of the expense having been defrayed out of the proceeds of a sale of *Athenæums*, *Art Journals*, and other books, not adapted for circulation. The ordinary sources of income to the Institution may be placed under three heads, viz., sale of tickets, money received from non-members on lecture nights, and sale of old newspapers; from the first of these the receipts during the year 1863 were £198 15s.; from the second £83; and from the third £4 10s. An analysis of the ticket account shows that during the year there were sold 84 at one guinea; 70 at 5s. 6d.; 81 at 4s. 6d.; 318 at 3s. 6d.; 223 at 2s. 6d.; 2 at 3s.; and 140 at 1s. 6d.; the two last of these are summer quarter tickets, the aggregate sale of which was 142, being but 71 for each quarter, and these at a very low price; by this decrease in the number of members during the non-lecture season, a heavy loss is entailed on the Institution, which only a lecture season of extraordinary success can make good. The sale of tickets admitting to lectures only has been 304, of quarterly members' tickets of all kinds, 530; making together 834; an average to each quarter of 208; adding the 84 guinea ticket holders, the result is 292, the average for the whole year. The balance sheet for 1863 shows that the receipts were £302 18s. 2d., and that there is a balance in the treasurer's hands of £27 11s. 4d.

Rotherham and Masbro' Literary and Mechanics' Institute.—The report of the past year says that the committee, having devoted their principal efforts to placing the finances of the Institution in a sound condition, and to the necessary improvements of the building, are glad to be able to report a fair measure of success. A considerable amount has been expended in rendering the building more commodious. The Lecture Hall has been decorated, and the lighting and warming improved. Arrangements have been made with the Rotherham Literary and Scientific Society to locate itself in the Institution; also with the Court of Foresters to have its meetings in the Lecture Hall. The number of the members at present is as follows:—Male subscribers, 134; female subscribers, 17; boys, 31; girls, 9. Total, 191. Lectures have not been supplied because they were not in demand to an extent that would warrant the invitations of unpaid lecturers, or guarantee the funds from considerable loss in the employment of paid ones. Pursuant to the report of the previous year, and to a resolution of the general meeting, the committee sought to initiate a movement towards the establishment of a Workmen's Club. As a first step they endeavoured to gain the co-operation of those for whose exclusive advantage the club was intended, and invited representatives from the various works in the immediate vicinity to meet them in furtherance of this object, but met with no response. Consequently nothing more was done; for although still convinced of the great utility of such institutions the committee did not feel called upon to take all the trouble and expense of an enterprise for the benefit of those who can and ought to aid them in this and all similar efforts. They venture to affirm, however, that their successors will be very ready to offer a co-operative hand to the workmen, whenever they shall awake to their true interests in this direction, and evince a desire to help themselves. In the report of the classes connected with the Institute regret is expressed at the small number of those who have availed themselves of the opportunites afforded them, and the great irregularity in attendance. The night-school for boys has had 19 names, whilst the average attendance has been barely 9; and in the girls' night-school, 2 only have attended. In the class for advanced reading there has only been an average of 6; in that of drawing, the average is $3\frac{1}{2}$; in the advanced arithmetic class the average is $5\frac{1}{2}$; whilst in that on the philosophy of common things, it is very little over 3. The balance-sheet shows that the expenditure of the current year had been £263 3s. $6\frac{1}{2}$d., leaving a balance due to the treasurer of £13 6s. $9\frac{1}{2}$d.; by the general account it was seen that the liabilities were £1,472 4s. 6d., leaving a balance against the Institute of £1,367 18s. $0\frac{1}{2}$d. The transactions in the Penny Bank have considerably increased during the past year, as the following table will show:—

	Dec. 1862.	Dec. 1863.
No. of accounts opened since commmencement, Oct. 1856	3347	4205
Remaining open	802	837
Number of payments	9602	10064
Average of each		$8\frac{3}{4}$
Amount received	£326	£387
Amount paid	£334	£370
Amount in the Sheffield Banking Company	£186 0s. 3d.	£193 10s. 3d.

ART-WORKMANSHIP PRIZES.

Our correspondent on this subject thus resumes his remarks. He wishes to correct an error of the press in his second article, which attributed the locality of the antique group of the "Graces" to the library at Vienna; the work in question is in the library at Sienna; its origin is, he believes, unknown, but the figures are doubtless of Greek or Greco-Roman workmanship of the best period.

Before wholly quitting the subject of arabesque, as involved in the articles selected for the current competition, it is advisable to point out the distinctive differences observable in the treatment of the same, accordingly as it is applied to subjects wrought in stone, or marble, and in metal. The chair-back adopted for the first section of ornament in Class 1, Carving in Marble, Stone, or Woods seems fittest for either of the two former materials; it is certainly less suitable for reproduction in the last, *i.e.*, wood; whatever might have been the original use of this model, its whole character seems proper to stone, and from stone originals the details of its design were probably borrowed. The Gothic bracket, third section of Class 1, although, of course, derived from a stone antitype, has more than enough of the fleshiness and freedom, the *embonpoint*, as the French say, and exuberance, which are desirable and best reproduced—where reproduction in another material is allowable—in a wooden one. The student of carving in any material, who desires to examine admirable examples of decorative design and execution, will find a splendid series in the casts of Venetian sculptures—principally from the Giant's staircase and the Mocenigo palace in that city—deposited by the late Prince Consort in the South Kensington Museum, and now placed against the wall of the east cloister of the north court. Many of these examples are the work of Sansovino, the famous sculptor, and supply instances of perfect combination and design, admirably adapted to modern uses. On the whole these are the finest arabesques yet known to me. Their execution leaves nothing to be desired, and, to those who do not appreciate the productions of the great Gothic sculptors, offer perfect models. They are almost as fit for application to wood-carving as to their original material. Grace and delicacy are their characteristics. Antique arabesques require a severer order of feeling and a graver kind of training to be obtained by our people, ere full justice will be done to them by the world in general.

It would occupy too much of my space to dilate upon the subtle but apt distinctions in the treatment of arabesque, which are, to the expert, palpably existent between its use in stone and in wood. The differences which present themselves between designs proper to metal and stone are more easily defined and more to the present purpose. If the teacher takes up the arabesque designed by Lucas Van Leyden, and proposed as a model for the prize in Class 6, Etching and Engraving in Metal, or that which supplies the subject for the section of ornament in Class 7, he will find perfect arabesques proper for reproduction in metal. The Flemish salver, to be used by competitors in the second section of Class 7, Repoussé Work, offers to this end, however, by far the best example of its kind in the series before us. It has been chosen for a model with consummate knowledge, not alone of its art-value, but of the material to be employed in its reproduction. With all its grace and richness, and the splendid wave-like sweep of the lines of foliage which compose it, there is in those lines, as well in the exquisite details of the flowers and leaves of this example, a certain firmness and rigidity of form and relief which differ exceedingly from the fleshy character and rotundity of the scrolls in the chair-back, or the sculpturesque beauty of the Venetian arabesques just referred to. In the salver the very inequalities of the ground, peculiar to, and desirable in, repoussé workmanship—inasmuch as the effect of the rich colour of the metal itself is thus insured, and endless variety in the play of light upon its surface obtained—have an apt display. The ancient workman was as thoroughly aware of the advantages of the seeming roughness derived from these inequalities, as it is certain that our ordinary modern craftsman is ignorant or thoughtless of the same. The slave of his labour, and narrowly taught, the latter aims at finish before all things, and seems as if he were loth to leave his work thus apparently unfinished. Consequently upon this narrowness of view, almost all modern repoussé works look as if they were machine-made, and derive little ad-

vantage from the peculiar material employed. The producer—in the stiffness of his intense conscientiousness, fears to wrong his employer by leaving even the appearance of incompleteness upon his work. The great thing to be considered with regard to the employment of splendidly-hued metal is the display of its colour; nothing does this so perfectly as the wavy and beaten surface of a fine piece of old repoussé work in gold, silver, or brass. In stone, of course, this aid to effect is not looked for, and it is not desirable to leave the "flat" or ground of a carving in the material so uneven as it may be in repoussé work.

The graceful but extremely rigid forms of the piece of chiselled iron, which served for a model in its class in the former competition, showed an admirable application of design to a material far less tractable than the softer metals. Some of the French and German works now in the South Kensington Museum are perfect specimens of chiselled iron. In the Hotel de Cluny, Paris, are many more. The fourteenth and fifteenth centuries produced the finest examples of skill in this matter; they are to be considered as wholly distinct from engraved works on iron, and are sculptures in the true sense of the word. Much armour of the sixteenth century combines repoussé with chiselled work. In these, no less than in the greatest statues, the material has its proper form of expression; the kind of arabesque that suits production in wood differs as greatly, or should do so, from that required for the decoration of stone, leather, or metal, as the materials themselves from each other. Experts are able to detect a certain inappropriateness of design in those antique statues which have been copied from bronze originals. It is hardly too much to say that no severer censure of a work could be pronounced than to say, justly, that its style resembles that of one produced in another material. A stone house built to look, as far as is possible, like a brick one, is never satisfactory to the eye of an artist; yet, to produce something of this resemblance seems to be the object of the elaborate chamferings of the edges of building-stones in debased architecture.

I was sorry to observe that the invitation of the Society of Arts with regard to the production of works in chiselled iron—for which the above-named example in that metal was selected as the model—was responded to insufficiently. Doubtless this kind of work is nowadays little used, but it might well be re-introduced; there are ample opportunities for its use in modern domestic arrangements. The beautiful example set before competitors in Class 3, Hammered work in Iron, Brass, or Copper, needs no commendation of mine. It is a German production, dated 1700. In the South Kensington Museum are some noble specimens of English work of this kind in the gates removed from Hampton Court, and now placed in the temporary or "boiler" building. Hammered iron work is, as may be seen on examination of the specimens referred to, totally different from that which is properly styled chiselled.

The next set of examples to which I propose to refer is, that of carving in ivory. Mr. John Webb has liberally allowed the Society to use, as models, two works in his possession. One of these is an exquisite little statuette, attributed to a famous native of Flanders, who worked at Rome, and is known by the name of François Flamand, surnamed Fiamingo; his true name was François Du Quesnoy. He was born in 1594, and of all the minor sculptors of modern times he is probably the best known. A considerable number of boys, in all varieties of spirited actions, and in many that represent sleep, are attributed to him. Few excel the one before us in beauty, faithful design, and delicate execution. The naturalism of the 16th century did its best in the latter. The little fellow lies upon his back, one arm is thrown above his head, the other lies by his side, relaxed in complete repose, one leg is crossed over the other. The face is charmingly pretty, and nothing can exceed the freshness and elaboration of the body and limbs. Few sculptors of any age have been so successful as Fiamingo in treating the full and rounded forms of early childhood. It is worth noting how ably the artist has, in the work now in question, given the naturally characteristic proportions of the human form at the period of infancy; the body, as that part of the frame which is most in use to supply the limbs with the materials for development, is then far greater in proportion to the others than at any other stage of existence. His legs are hardly to be considered as locomotive organs; the head is comparatively immense; the chest undeveloped, because no great vitality has yet to be sustained by rapid breathing; and physical exercise has not yet called upon the lungs to perform their office to the full; the arms are almost as subordinate as the legs. The baby sleeps that it may grow. The surface of the model is exquisitely wrought; I need hardly point out how lovely are the forms of the elbows, especially where the bones of the fore-arm are cunningly indicated through the soft and almost pulpy flesh. The markings on the chest deserve heedful attention.

The second example to be employed for ivory carving has great beauty of its peculiar kind. A singular interest attaches to the history of works of its class. The models in question are the two covers of a tablet, carved in *mezzo-relievo* with the figures of females, which may, for want of better titles, be said to represent War and Peace. Each is enclosed by a sort of tabernacle, such as was so common in Italian works of the later half of the 15th and the 16th centuries. In each, two columns support canopies of different character; the figures stand upon flat bases, which have arabesques delicately wrought upon their fronts. The works are probably Italian or French, and of about the beginning of the 16th century. They formed the covers of a tablet which might have contained wax, and was used as a sort of note-book, the soft surface of the wax being written upon with a silver, ivory, or gold point or stylus. Such things had been in use among the ancient Romans, and we find Martial and Juvenal, in the age of Augustus, referring to their employment in various ways and to their having been given by friends as keepsakes. At a later date such articles were distributed somewhat in the fashion of our times, when a member of Parliament gives to his best supporters at an election lithographed portraits of himself. This class of works forms one of the most important and historically interesting sections of minor Roman sculptures which has come down to us. The articles were sometimes styled *pugillares*, because they were carried in the fist or hand. Bribery and corruption of electors took effect by means of them; and so late as the fifth century after Christ we find the Emperors prohibiting such gifts by any but officials of the highest rank.

A noble subject has been given for a model to the class of chasing in bronze, the section of the figure, by a machine-reduced cast from the well-known antique Roman bust generally styled "Clytie," but also recognised by the name of "Isis." This sculpture represents the features and the form of some long-dead lady, it may be an empress, and, independently of its artistic value, offers some curious points for our consideration. Judging from its style it would seem to have been executed in the first century of our era, and to be the work rather of a Roman or Alexandrian sculptor, than one of those Greeks who were settled in Rome, or whose works were imported to that city. Beyond all question it is a portrait, somewhat idealized in treatment, but still preserving all the character of a likeness. After the Roman fashion the hair grows low upon the forehead, is parted in the middle, and flows in crisped waves, to be gathered at the back of the head and drop its ends upon the neck. The surface of the marble is perfect, and its fleshy treatment offers to reproducers a beautiful though not severe model. Its names of "Clytie" or "Isis" are respectively adopted by those who accept the petal of a flower from which the bust issues, either as those of the sun-flower—into which Clytie, the nymph who loved Apollo was turned (whose love

compelled her, when transformed, to follow with her face the daily course of the god), or of a lotus, the flower that was sacred to the Egyptian goddess Isis. It is nevertheless simply a portrait in character. I do not know where it was discovered, but the original is now in the British Museum—where I beg competitors to study it—numbered 79, and was originally part of the famous Towneley collection. Towneley bought it at Naples of the Laurenzano family, and set so great a store by it that—when he conceived his house to be in danger from the "No Popery" mob of Lord George Gordon's Riot, 1780—he chose it, of all the treasures he possessed, to be removed out of harm's way by himself, in his own carriage.

THE BRADFIELD RESERVOIR.

The following is from a correspondent:—

There are two or three points which attracted my attention on visiting the broken embankment at Bradfield, and the first was, that the place was not suited for the formation of a reservoir at all, on account of the absence of a position on which a good retaining embankment could be built. It is at all times difficult to obtain a water-tight junction between clay and rock, and this circumstance has already given great trouble in forming embankments, as in the case of Doe-park Reservoir, near Bradford, where the ends of the puddle wall had to be turned and carried up the interior slopes of the reservoir until the clay gradually merged into a stiff argillaceous soil. How much more, then, was it a difficulty at Bradfield, where the puddle had to be abutted on a loose porous sandstone, alternated with layers of friable shale?

The difficulty of obtaining a proper, sound foundation for the embankment, more especially for that part of it which was composed of puddle, gave rise to one of the weakest points in the Bradfield Reservoir. The materials used in the construction of this work have been largely abused, but I think that their inferiority has never been exaggerated.

A mixture of large stones, about one cubic foot in size, and masses of the porous shale obtained from the slope of the valley, seem to have been aggregated together in the rudest manner possible. It would be easy to understand why this mass, used as the material for construction, wanted uniformity in its composition, if, as is said, it was similar to that used in the Ogden Bank. There the materials are certainly the same, and were being heaped up to form a bank, about the time of the inundation, by means of "tips," some being placed about fifteen feet high, near the centre of the bank.

Not only is it impossible that a bank constructed in this way can settle equally, but the very mode of making it, viz., 'tipping' the material from either end, and gradually approaching the centre, renders the section at this part the weakest of all. And it is to be noticed that it was at this part of the Bradfield Dam that the rupture took place. So porous did the bank seem that there can be little doubt that the water could easily ooze through it, saturating it and bringing upon the inside of the puddle wall almost the entire pressure of the water stored in the reservoir. This appears to be corroborated by the fact that near the top of the inside slope of one of the parts still standing there is a longitudinal depression, increasing in depth towards the gap, and indicating that when the bank gave way the water in the inner half was drained off from the two ends towards the centre, carrying with it part of the material, thus causing the subsidence referred to. The puddle also, though in some cases good, appeared to be occasionally not quite free from shale; coupled with which, the outlet pipes were carried in a very loose way through the materials spoken of.

It is difficult to determine, after the accident, which of all these weak points was the proximate cause of the failure of the dam, but it is probable that it occurred in some such way as the following:—

It has already been said that, up to the puddle wall, the bank must have been saturated, which would cause a subsidence of material to fill the interstices, and bring on every point of the wall particles of water, having a pressure corresponding to their depth, and searching for means of escape through the bank. This means the water appears at last to have found, either through a slight fissure caused by unequal subsidence, or most probably along the outside of the outlet pipes. Having once got to the other side of the wall, a similar subsidence would have been formed on the outside of the bank. In this way the first crack, probably, originated. The settlement on each side, then, would leave the top of the puddle wall unsupported to any extent, and it is easy to understand how the wave-force of the water would overturn the top of the puddle, and break it transversely. According to all accounts, the waves on the dam, at the time of its bursting, resembled those of the sea, and broke against the bank with such force that the spray rose high above the top of the embankment. When the water had thus acquired a passage over the ridge of the bank, it rapidly destroyed the outside, and cut its way down to the bottom of the gap. Once through this, its velocity increased with fearful rapidity—it carried destruction for many miles—accounts of which we have all read with horror.

Such, perhaps, was the manner in which the Bradfield accident occurred, and this would show the necessity of making a reservoir embankment water-tight altogether, and of protecting it from the action of waves by means of traverses built in the dam.

Fine Arts.

Market Price of Works of Art in France.—The enormous prices which have of late been obtained in Paris for pictures and other works of art have given rise to much discussion, and to many comparisons with the results of the sales of former times. It is difficult to establish an exact table of the fluctuations in such matters, for more reasons than one; in the first place, there is the diminished value of money to be taken into account, and, in the second, the comparison must often be made not on the same picture, but on pictures of the same class by the same master, between a special case on the one hand and the average prices on the other; or, lastly, between the average prices at the various periods. Still, allowing for all the difficulties and the amount of uncertainty resulting from them, the increasing value of pictures is so marked, and, with some exceptions, regular in its course, that it furnishes a very curious study from more than one point of view. At the Sireul sale, in 1781, a charming portrait of the Marquise de Pompadour, in pastels, by Boucher, sold for 900 francs; at the same sale an admirable picture by Terburg went for 702 francs. In the following year the "Serinette Player" of Chardin was knocked down, at the sale of the pictures of the Marquis de Menars, at 631 francs; and three portraits of Louis XIV., at different ages, enamels, by Petitot, with chased gold frames, only fetched 399 livres and 19 sols. At the Lancret sale, in the same year, the best pictures by the deceased artist fetched only 201, 250, and 112 livres respectively, and another only 19 livres or francs. In the same year, at the Nogaret sale, Rembrandt's "Good Samaritan" was bought for 900 francs, while not long since an artist's proof of the engraving of the same picture, by the painter himself, fetched 2,400 francs. An excellent picture by Watteau was allowed to go for 200 francs, at the Bélisard sale, in 1783; and at the Lebrun sale, in 1791, Holbein's large picture of the "Court of Francis II.," went for 40 francs; Poussin's "Alexander and Diogenes," for 240 francs; and a bronze statuette of a "Woman Bathing," by Jean Goujon, now worth at least its weight in gold, 20 francs! In 1797, a

good picture, by Lesueur, sold for 161 francs; and two works of Lancret, for 84 francs! In 1801, the picture of Gonzalès Coques, which at the Patureau sale fetched 45,000 francs, could not find a purchaser to bid more than 3,000 francs at the Robit sale. In 1803 the portrait of the Burgomaster Six, by Rembrandt, was sold publicly for 1,310 francs; and one of Clodion's charming terra-cottas for 150 francs. In 1809, a charming picture, by Watteau, four characters in Italian comedy, was only valued at 70 francs; and in the following year a fine portrait of "A Lady," by Vandyck, went for 481 francs. The following table, exhibiting the maximum price obtained for the *chefs d'œuvre* of Hobbema, will illustrate the rising of the scale in a still more striking manner:—

1789 ...	300 livres	.... Tronchin	.........sale.
1802 ...	4,200 francs	.... Helslenter	,,
1808 ...	1,399 ,,	.... Robert	,,
1809 ...	850fr., 1200fr., 532fr.,	Schwanberg	,,
1810 ...	119fr. 95c.	.... D'Orsay	,,
1812 ...	1,000 francs	.... Villers	,,
1814 ...	2,400 ,,	.... Paillet	,,
1817 ...	7,100 ,,	.... Lapeyrière	,,
1821 ...	11,900 ,,	.... Lafontaine	,,
1832 ...	7,210 ,,	.... Erard	,,
1841 ...	30,000 ,,	.... Heris	,,
,, ...	23,000 ,,	.... Perrégaux	,,
1850 ...	27,000 florins	.... Guillaume II. ...	,,
1852 ...	72,000 francs	.... De Morny	,,
1857 ...	96,000 ,,	.... Patureau	,,

At the last-named sale the "Two Cousins," by Watteau, realised no less than 55,000 francs! The value of china, and other objects of art or curiosity, has kept pace with that of pictures and sculpture; in fact, in the case of Rouen, Nevers, Palissy, and other wares of that class, and of Limoges enamel, the increase has been even greater than that which has taken place with respect to pictures. In many cases the lapse of half a century or more has naturally increased the value of the object, but this will not account for the tithe of the difference between old and present prices.

INTERNATIONAL EXCHANGE OF COPIES OF WORKS OF FINE ART.—The committee of the Council of Education have lately approved of the following memorandum on the International Exchange of Copies of Works of Fine Art.—1. The collections at South Kensington now possess many examples of works of fine art executed in various kinds of materials which are unique for their beauty, excellence, and rarity. 2. In like manner most of the Art Museums of the Continent contain similar works. 3. Such objects must always remain permanently as national treasures of the respective country possessing them. 4. Although the originals cannot be acquired, various modes of reproduction are now matured and employed, such as electrotyping, photography, elastic moulding, &c., whereby admirable substitutes may be easily obtained with perfect security to the originals. 5. The important National Art Museums at Paris, Berlin, Dresden, Munich, &c., already possess plaster casts of ancient marbles, representing originals which are not in their own possession. But no comprehensive system appears yet to have been matured of employing electrotyping or photography to obtain copies of objects. 6. A commencement of issuing duplicates of fine objects useful in general art instruction, however, has been made by the South Kensington Museum. For example, through the intervention of His Royal Highness the Prince Consort, copies have been obtained of the numerous works of fine art in the possession of Her Majesty the Queen. Through the liberality of His Majesty the Emperor of the French, the Science and Art Department was enabled, in 1855, during the Paris Exhibition, to obtain electrotypes and photographs of numerous objects in the Louvre and Musée d'Artillerie, at Paris. Photographs also have been taken of the most important objects, which for public instruction and gratification were so liberally lent to the Department by private proprietors during the International Exhibition of 1862. The University of Oxford has unreservedly permitted photographs to be taken of its original drawings by Michael Angelo and Raffaelle. Arrangements now exist at the South Kensington Museum by which every object of the art collections may be copied by some one of the many processes. 7. The period, therefore, seems to have arrived when friendly relations might with reciprocal advantages be established between foreign museums and the South Kensington Museum for the purpose of organizing some system of international exchange of copies of the finest works of art which each museum possesses, through Her Majesty's Secretary of State for Foreign Affairs, by correspondence with the governments of the various countries which possess museums and works of art. 8. The accompanying art inventory of the South Kensington Museum shows the nature of the objects already the property of the Museum. Many objects of exceptional beauty and rarity might be copied, and the nature of the copies has been indicated in the inventory. These might b deemed worthy of the acceptance of the museums of other countries. At the same time it may be observed that every object named in the inventory might be copied if desired. 9. A copy of this catalogue should be forwarded to Her Majesty's Ministers abroad, through the Foreign Office, to be delivered to the various governments. A request should be made to such governments to forward to the South Kensington Museum any printed or MS. catalogues of their own museums in which the objects, excellent and rare, might be denoted in a similar way. Opportunity might be taken to inquire if the respective governments would be disposed to entertain the idea of an exchange of copies of objects, and, if they should concur in the idea, to ask them to authorize the various Directors of Museums to communicate directly with the Lords of the Committee of Council on Education, at the South Kensington Museum. Copies have been sent to the British Ministers abroad.

Manufactures.

THE PRESENT STATE OF KNOWLEDGE IN REGARD TO GUN-COTTON.

At a time when the chief nations of the civilised world are occupied in experimenting on the arts of attack and defence, it will be considered neither uninstructive nor uninteresting to the scientific world, to consider the state of knowledge in regard to what may become one of the most powerful engines in human warfare.

The discovery by Schönbein, in 1846, of pyroxylin, or gun-cotton, was predicted by Pelouze in 1838, who found that cotton, hemp, linen, paper, &c., when immersed for some minutes in nitric acid, and then well washed, became substances of great combustibility. In the brief history of the substance, various have been the changes to which it has been subjected in scientific and professional opinion on the practicability of its application to warlike purposes. From time to time, certain acquired knowledge has brought to light the various properties of gun-cotton, known under the names of pyroxylin, nitro-cellulose, &c., but since the report of the French Commission, the record of whose experiments was published in 1852, and whose decisive verdict was that, "Dans l'état actuel, il n'y a pas lieu de continuer les expériences au point de vue de leur emploi dans les armes de guerre," the subject may be considered to have been set aside until within very lately.

The revival of the question may be fairly attributed to the increased attention paid by scientific and military men to the arts of war in all countries, and to the labours of continental chemists, the latter being evidenced in the report of June, 1863, on Baron Lenk's gun-cotton, presented to the President of the Austrian Imperial Commission on Gun-cotton.

The method pursued by Schönbein was to steep finely divided ligneous matter, as cotton-wool, for a few minutes in a mixture of nitric acid and concentrated sulphuric acid, afterwards squeezing, washing, and drying it; this substance being found to ignite at about 400° F. or even lower. Gun-cotton has, however, been manufactured by various persons by acting on cotton with mixtures of nitrate of potash and sulphuric acid, but these processes have been so varied in detail as to result in an infinity of substances known under the general name of gun-cotton.

The usual preparation of gun-cotton is by the mixture of three volumes of nitric acid with five volumes of concentrated sulphuric acid; this mixture having been allowed to cool, the dry cotton is immersed by degrees in the fluid, remaining therein 15 or 20 minutes; it is then compressed, freely washed, and dried by cloths, or a current of air at a temperature of 90° F. The reaction of the nitric acid on the cellular substance of woody fibre may be stated in the following equation:—

$$C_{24}H_{20}O_{20}+5\,(NO_5HO)=8\,HO+\overbrace{C_{24}H_{17}O_{17}+5\,NO_5}^{\text{Gun-cotton.}}$$

The explosive force of gun-cotton manufactured in the manner above described being much greater than that of gunpowder, the instantaneous strain is too great for the metal of the gun to withstand, and hence one of the reasons for the non-substitution of gun-cotton for gunpowder.

The objections to the use of gun-cotton thus manufactured may be briefly stated. Firstly, the low temperature at which it explodes, 400° F. and even lower. Secondly, its facility of explosion by percussion. Thirdly, the aqueous character of its products after explosion. Fourthly, rapidity of explosion. Fifthly, its liability to spontaneous explosion, and the production of gelatinous matter.

Its advantages consist in the obvious facilities of packing, transport, and employment, besides its compressibility and its not being injured by exposure to the action of water. The fact of carbonic oxide, one of the chief products of its combustion, being a poisonous and inflammable gas, has prevented gun-cotton from being used in military mining when galleries are used in the operations. A remedy has been proposed by combining gun-cotton with nitrate of potash, by which carbon is changed into carbonic acid, the other chief products being nitrogen and water.

The experiments of Baron Lenk, at Hirtenberg, have occupied many years, and although we are not warranted in accepting every statement which has been made with reference to the gun-cotton manufactured by him, it is right that we should admit the advance in knowledge which has attended his assiduous researches upon this subject. The Austrian Commission has proved, at least as far as its conclusions go, that one part of gun-cotton is equivalent to three parts of gunpowder, and that, as prepared by Baron Lenk, it is more uniform in explosion. The process, as far as we understand it in this country, is as follows:—Cotton yarn twisted into strands is steeped for a few minutes in nitric acid and washed; it is then left for forty-eight hours in a bath containing equal volumes of sulphuric and nitric acids. After being squeezed it is exposed from four to eight weeks in a stream of water, and then dried and finally soaked in a boiling solution of potash in order to render it slower of combustion, and non-explosive by percussion. The distinguished chemists, who report upon Baron Lenk's gun-cotton, argue that in consequence of the difference of detail in the processes of the experimenters upon the subject, but little value can be attached to the past experience of gun cotton. The variations in detail may be stated to be variations as to strength of acids, temperature, duration of chemical action, removal of free acid, and conditions of mixing. When we consider the little which has been done in this country on the subject, it is consolatory to know that the French Commission, after six years' labour, failed to arrive at any definite result, and, according to the Austrian report, neglected not only to ascertain the true composition of gun-cotton, but also whether the substance upon which it experimented was the same, in a chemical point of view, all through the series. It is certainly fair to insist upon the fact, that the method of preparation in the French experiments is very different to that employed by the Austrian Commission. In the analysis of the Lenk gun-cotton by the Austrian Imperial Engineers' Committee in 1861, it is shown that it is almost entirely composed of tri-nitro cellulose, while it should also be stated that experiments in this country do not agree in the importance attached by General Lenk to his treatment of gun-cotton with soluble glass. With reference to the statement made in the report, complaining that if a comparison be instituted between gunpowder and gun-cotton, then the difference in the true composition of the charcoal used should be appreciated, it is sufficient to reply that in this country, at all events, the preparation of wood-charcoal for the manufacture of gunpowder is conducted in such a manner and by such a process as to ensure a high degree of uniformity, and that the manufacture of gunpowder, so far from being in the hands of ignorant persons, as is stated by the report to be the case in Austria, has almost attained with us a climax of scientific ingenuity and accuracy.

Notwithstanding the assumptions and arguments used in the report with regard to the unalterable quality of the Lenk gun-cotton, and also a statement to the effect that a quantity of cotton was exposed, after lying in a pond for six weeks, to a stream of water, then to the air for one month, and failed to redden litmus paper, it is considered that proof has been obtained by experiments carried on in this country that an acidity will become manifest in the Hirtenberg gun-cotton during the drying process, and that this acidity remains after storing in wooden or metal-lined cases, even if these are kept ventilated. It is possible that higher nitro-compounds, which exist in minute quantities in Lenk's gun-cotton, are decomposed, and the acid observed—the result of their change—while there is ground for believing the *tri-nitro cellulose* to possess greater stability. The apparent argument that the acidity observed in stored gun-cotton is of no more value than the minute changes which occur in gunpowder, is not to be entertained for an instant, because the evolution of heat in the case of gun-cotton is far greater than in that of gunpowder, and sufficient to lead to the ignition of the material. The statements which the Austrian chemists make in regard to the unfitness for ballistic purposes of gunpowder which has been exposed to the action of the atmosphere, are sufficiently contradicted by Mr. Abel, the chemist to the War Department, of all persons the most experienced on such a subject. In the report of Lieut.-Colonel Baron Von Ebner, the lowest explosive temperature of the Hirtenberg cotton is fixed at 276° Fahr., but there is nothing contained in the Austrian report which can be admitted to support the assertion that the cotton is not spontaneously explosive, while it is fair on the other hand to publish the fact, that only one seemingly spontaneous explosion of Hirtenberg cotton has occurred in ten years. There can be no doubt that the assertion in regard to the safety of the process employed at Hirtenberg is perfectly correct, and that as the material acted upon is in a moist or wet condition during the operations, it is of course non-explosive. In the magazine at Hirtenberg not one explosion has occurred in the space of twelve years, while there has been only one explosion in the manufactory, and that resulting from improper speed in the working of the machinery. The theoretical proofs offered in the report against the spontaneous explosibility of the gun-cotton are, that the atoms of hydrogen, which in ordinary cotton are acted upon by the atmospheric oxygen—heat being generated—are disposed of by "azotization," that by the long acid-steeping nothing remains for the oxygen of the air to act upon, and, finally, that slow decay cannot affect the gun-cotton. The *force brisante*, or *vis viva*, of gun-cotton being far greater than

that of gunpowder, it follows that the strain upon the metal of a gun is proportionately increased, and hence greater danger of bursting. The proposal in this report to construct guns specially adapted to bear the enormous strain of the explosion of gun-cotton, will be received with considerable caution in this country, a feeling which the obvious fact of the greater amount of heat generated, and consequent action upon the metal, will not tend to remove. It is stated, however, that the oxidation of the metal of the gun—if there be any—will be less than that of gunpowder, when the products of the combustion of gun-cotton are considered.

The following analysis was made by Lieut. Von Karolyi, in the Chemical Laboratory of the Engineer Corps Committee:—

Gases of Combustion.

	Volume per cent.
Nitrogen	12·67
Carbonic acid	20·82
Carbonic oxide	28·95
Hydrogen	3·16
Marsh gas	7·24
Carbon	1·82
Aqueous vapour	25·34
	100·00

Whether it might not be possible to employ elongated cartridges of gun-cotton for artillery purposes, thereby spreading over a greater surface the instantaneous explosive force, is a question worthy of consideration by practical men. The gases of both gunpowder and gun-cotton are irrespirable, but it may be safely asserted on the side of gun-cotton that the gases produced being lighter, and not containing the solid particles of sulphide of potassium, as is the case with gunpowder, are more easily removable by ventilation. A consideration of the report induces attention to the following chief statements:—That the Lenk gun-cotton almost entirely consists of nitro-cellulose, and as manufactured at Hirtenberg, one invariable product results. That it is not subject to notable alteration, nor is it prone to explode spontaneously. That the temperature of ignition is sufficiently high to remove fears regarding its ordinary usage. That the *force brisante* can be moderated; this latter statement, however, requiring full experimental investigation, and that the dangers in military mining from the irrespirable nature of the product of the combustion, are fully as great in gunpowder as in gun-cotton. It is scarcely necessary to add that these assertions can only be accepted with reservation, and that it is to be hoped the attention of chemists and military men will be turned to a searching and rigid examination of their truth, with a view to our further enlightenment on so important a subject.

A New Gun has recently been invented by Mr. James Mackay, of Liverpool. The principle in all rifled cannon appears to have been to allow as little windage as possible, and to make the shot fit the grooves of the piece, taking from them a rotation in its flight. Mr. Mackay, on the other hand, has conceived the plan of having the grooves so arranged that, while the shot fits closely to their outer edge, the grooves are left open for windage. By this arrangement the gas has to travel some feet further than the shot, and in doing this is said to impart a rapid and perfect "spin" to it. The shot are of cylindrical form, smooth, with conical heads, and cupped at the other end in proportion. Mr. Mackay also claims a peculiarity in the wadding, which is of sawdust, and at the movement of the first ignition of the powder the elasticity of the wadding moves forward the shot slightly; the effect is that the whole of the powder is stated to be burnt, and the shock on the breech of the gun is considerably lessened. A gun on this principle has been made by the Mersey Steel and Iron Works Company. It is of wrought iron, weighs nine tons, has a bore of 8·12 inches, and in other respects corresponds with the general features of the ordinary 68-pounder. There are 12 grooves, and, as the shot do not enter these grooves, it allows of a much sharper twist than in ordinary rifled guns. The velocity has been found to be 1,640 feet a second. Messrs. Laird and Company, of Birkenhead, are now building an armour-plated vessel called the Agincourt, for the Government, and the gun has been tested against a section of the side of that vessel. This target consisted of an outer plate, 7 feet square and 5½ inches thick, of rolled iron; next came 9 inches of teak, then an inner plate or skin three-fourths of an inch thick, then angle iron and ribbing, and finally a backing up with timber balks and supports 18 inches thick. The gun was charged with 30 lb. of powder and a cast steel shot, weighing 167 lb. The range was 200 yards. At the point of impact a perfectly circular hole was cut. The shot then powdered the teak, passed through the inner skin and the angle iron, shattered the timber balk, and was picked up 82 yards beyond the target, together with a circular piece of the iron armour, about 80 lbs. weight, it had carried with it through the back supports. The sand showed that it had spun to the last. The shot when found was reduced from 13 inches to 11 inches in length, and increased about an inch and a half in diameter at the end which struck the target. The other end was uninjured. The whole target was forced back about six inches, and so much deranged that more shots were not fired.

Copper Mining in Lake Superior.—The total amount of capital invested in the fee-simple and development of the mines now working, not including the value of the metal produced, is estimated at about 6,000,000 dollars, while their stocks are worth over 15,000,000 dollars. The aggregate amount of copper produced in 1863 was not less than 9,000 tons of stamp work, barrel and mass, or about 7,500 tons of ingot, worth at its present value over 6,000,000 dollars, or the total sum of money thus actually invested; but as the largest portion of it was probably sold at an average of 35 cents. per lb., the aggregate receipts of sales will not be much over 5,000,000 dollars, from which about 1,000,000 dollars has been, or will be, divided among the shareholders, with still full treasuries, so far as most of the mines are concerned.

Production of Oxygen Gas.—In a paper read before the Pharmaceutical Society a short time since, Mr. Robbins described a new, scientific, and cheap method of producing oxygen gas. After adverting to the various methods hitherto employed, he says:—"It will have doubtless been observed by you that in all the processes hitherto known a high temperature is necessary, and until that point is reached, no product whatever is obtained: this fact we may consider as the chief difficulty experienced in the preparation of oxygen, and more especially so when sulphuric acid is used. If, for example, by the mere addition of sulphuric acid to bichromate of potash in the cold we could get the same results which are obtained by the application of heat, this process, instead of being thrown in the rear, would have taken front rank. Oxygennesis therefore stands alone as a novel and the only mode we possess for producing oxygen without the application of heat. The mode of using this compound is extremely simple. We have only to take some of this powder, place it in a glass flask or bottle provided with an exit tube, pour on either of the dilute mineral acids, and we have immediately oxygen evolved in a similar way, and with as much facility as hydrogen is obtained from zinc, or carbonic acid from a carbonate. The composition of this compound is extremely simple, merely a mixture of peroxide of barium and bichromate of potash; not so the chemical changes resulting from the addition of an acid. Peroxide of barium on addition of sulphuric acid is resolved into sulphate of baryta and peroxide of hydrogen, and it is from this sometimes so-called oxygenated water we get this curious and interesting chemical reaction. Whenever peroxide of hydrogen and chromic acid are brought in contact with each other, instantaneous

decomposition is the result; the chromic acid is reduced to sesquioxide of chromium, and the peroxide of hydrogen to water, at the same time pure oxygen derived from both those substances is disengaged. * * * * We are not compelled to use precisely the ingredients mentioned, but may substitute analogous compounds. Peroxide of barium might be replaced by any other peroxide capable of forming binoxide of hydrogen, of which there are several,—peroxide of potassium, sodium, strontium, and calcium, but all these at the present time are practically useless, peroxide of barium being the only one that can be easily and cheaply prepared. Bichromate of potash may be substituted by manganate or permanganate of potash, binoxide of manganese, or binoxide of lead; the cost of the two first-mentioned forbids their present use, and the one selected is by far preferable to the others. With regard to the acids, either of the mineral class will do, but I prefer sulphuric acid. The next question demanding our notice is, in a commercial point of view, a most important one; however much this method may be admired for its simplicity, and the ease with which the operation may be conducted, its ultimate success or failure must depend on the cost. Can the oxygennesis therefore be manufactured and sold at a price sufficiently low to make it an article of commerce? I believe it can be made available for all purposes whenever oxygen is required to the extent of some gallons. One of the ingredients of this compound, peroxide of barium, has never yet been produced and sold as a commercial article, and from the trouble in making a small quantity, but few, even practical chemists, care to prepare it for themselves. It can hardly therefore be expected that a compound of this nature can at once be manufactured and sold at a price it must ultimately be reduced to, if extensively used and produced in quantity. Five shillings per pound, the price hitherto charged, would, I admit, be a barrier to its general adoption; but I am happy to say we have now made the necessary arrangements to lessen the cost of production, and have at the same time reduced the price to three shillings for the one-pound bottle, and less if a larger quantity is required. Some of the baryta compounds are found abundantly in nature, and are but of small value in the market, but up to the present time but few uses have been made of them; they now promise a much more extensive application. Mr. Kuhlman has perhaps done more than any one else to develope their uses and value in the arts."

The Michigan Petroleum, lately discovered, has been analyzed, and found to be of a very superior quality. It is said to have less odour than the crude Pennsylvania oils, and will yield 20 per cent. more of the refined article than the former. Its specific gravity is 40 deg. That of the Pennsylvania oil ranges from 45 deg. to 47 deg.

Colonies.

Machine for Ship Pumping.—A Hobart-town paper speaks of a new machine (the invention of Capt. Christie) for working the pumps of a ship in the event of her making a large quantity of water. The machine is on the principle of a child's roundabout, but where the horses are placed in that apparatus masts are fixed in this, which are six in number; sails are attached, so arranged that three must always be full of wind whatever direction it may blow, the other three being edge on and consequently powerless. A strong motive power is stated to be thus obtained, which causes the centre shaft to revolve, and this in turn works cranks communicating with the pumps. The machine can be constructed easily out of such materials as are ever to be found on board a loaded ship. Capt. Christie also thinks of applying his idea for the purpose of raising water on the farm for irrigating.

Canadian Finance.—The public accounts for the year 1863 exhibit a more favourable balance than has been the case for several years past. The five great sources of revenue—customs, excise, public works, post-office, and territorial revenue—have produced 7,662,490 dollars, which exceed the receipts from the same sources in 1862 by 1,104,961 dollars; the minor revenues of the consolidated fund have realised 914,821 dollars, being an increase upon 1862 of 119,335 dollars; and the receipt of the trust funds and other open accounts have been 1,183,004 dollars, which is an increase of 127,575 dollars. While the revenue has thus increased in the aggregate 1,351,871 dollars, there has been a diminution of expenditure to the extent of 228,873 dollars, making a total of 1,580,745 dollars; but in spite of this great improvement upon 1862 there is still a serious deficiency, although very much less than was estimated. The expenditure, less redemption of debt, has been 10,742,807 dollars, the receipts, less sale of debentures and sinking fund, 9,760,816 dollars, leaving a deficiency of 982,941 dollars. Large as is the deficiency in this balance sheet, it is an immense improvement on the deficits of the last ten years. Of the deficit more than half is accounted for by extra militia expenditure and extra legislative expenditure.

Jamaica Cotton.—The reports from the cotton fields belonging to the Jamaica Cotton Company say that things are there looking very well. There are well established and bearing fields of 350 acres out of 560 acres first put in, from which, with average weather for gathering in the crops, shipments should be made this year, at different periods, of 350 bales of good marketable cotton. The district is well supplied with labour. The sugar planter is equally as anxious as the cotton grower for the successful cultivation of cotton in the district.

Electric Telegraphs in New Zealand.—£150,000 has been set apart by the General Assembly from the £3,000,000 loan lately sanctioned, for the purposes of telegraphic communication, and £75,000 has been allotted for telegraph works to be carried out within a period extending to March, 1865. The first portion of the main trunk line is now nearly completed, and messages will shortly be transmitted along that section.

New Zealand.—A Lyttelton paper says:—"Canterbury is a noble estate. Let a little capital and a little labour be properly expended upon the soil, and every acre rises steadily to at least ten times its original value. If it could be clearly explained in England that all who came to Canterbury became at once on landing joint proprietors in a valuable estate, valued at some ten million sterling, we cannot doubt for an instant that a large and sustained immigration would spontaneously spring up. The people of Canterbury may well hug themselves on the value of the possession which has fallen to them. Scarcely a tithe of their inheritance has been realised, and already they can point to well-made roads stretching far into the plains, to rivers bridged over here and there, to innumerable creeks made passable, to cities cleansed and beautified, and, more important than all, to a commencement of a system of railways. Long before the last acre of Canterbury has been disposed of, it may be made a thickly-peopled, settled, cultivated land, intersected with railways and telegraphs, its rivers bridged, its towns connected with the principal city, and that city connected with a port furnished with all that is needed to make it a perfect harbour. Nothing has been done towards forwarding the harbour works at Lyttelton, or extending the railway system, or bridging the rivers. If the country means to have these works carried out it must stir itself up and insist upon proper steps being taken. Every one knows that the continuation of the land sales depends upon the opening up of the country, and that the rivers that intersect the plains offer most serious obstacles to this object being carried out."

Shipbuilding in New Zealand.—This branch of trade is securely establishing itself in this colony. Eight shipwrights have arrived by the *City of Dunedin*, and immediately found employment at the yard of Mr. J.

Wilson, who has two vessels on the stocks and a large punt nearly ready to launch. At another yard a schooner has been recently launched.

Publications Issued.

Elements of Physics, or Natural Philosophy, written for general use in plain or non-technical language. By Neil Arnot, M.D., F.R.S. Sixth edition, thoroughly revised, and containing in the second part (to be published in October next, price 10s. 6d.) the new completing chapters on Electricity and Astronomy, with an outline of Popular Mathematics. Part I. 8vo. pp. 430, price 10s. 6d. cloth. (*Longmans.*) In the preface the author explains that after publishing the first volume and half of this work, successive editions of the unfinished book were rapidly called for, but that after the fifth he would not print it again until he should be able to complete it to his satisfaction. In the meantime, besides his direct professional business, he could not avoid giving assistance in some parts of the public service where it was requested—as by the General Board of Health in regard to sanitary affairs, and when the government honoured him by appointing him a Member of the Senate of the New University of London. Such engagements have delayed the completion of this work, until by withdrawing from professional labours, as now, he has full command of his time. In the introduction the author says, in relation to physics, "In the course of the preceding disquisition, we have seen that physics or natural philosophy, the subject of the present volume, is fundamental to the other parts of science, and is therefore that of which a certain amount of knowledge is indispensable in a sound education. Bacon truly calls it 'the root of the sciences and arts. That its importance has not been marked by the place which it has held in common plans of education is owing chiefly to the misconception that deep knowledge of technical mathematics, which only a few have leisure to acquire, was only a necessary preliminary." In relation to mathematics he says, "Now it is true that a certain amount of mathematical knowledge is necessary to the student, but it is equally true that the mathematical knowledge acquired by individuals generally, in the common experience of early years, is sufficient to enable students, with a little help, to comprehend the fundamental laws of nature; nearly as the knowledge of language obtained at the same time and in the same way is sufficient, without the previous study of abstract grammar, to enable persons to understand conversation on all common subjects. Few persons in civilised society are so ignorant as not to know that a square has four equal sides, and four equal corners or angles, that every point in the circumference of a circle is at the same distance from the centre, or who do not immediately discover whether a tree or pillar observed stands upright or leans, whether a table is level or inclined, whether two lines are parallel or not, and so forth. Now these are fundamental mathematical perceptions, and it will be shown in the mathematical appendix to this work that such truths reach far in explaining the great phenomena of nature." In relation to the importance of physics to medical practitioners, he says, "Physics is also an important foundation of the healing art. The medical man, indeed, is the engineer pre-eminently; for it is in the animal body that the highest perfection aud the greatest variety of mechanism are found. Where, to illustrate mechanics, is to be seen a system of levers and hinges, and moving parts, like the limbs of an animal body; where such an hydraulic apparatus as in the heart and blood-vessels; such a pneumatic apparatus as in the breathing chest; such acoustic apparatus as in the ear and larynx; such an optical instrument as in the eye; in a word, such variety and perfection as in the whole of the visible anatomy? All these structures, then, the medical man should understand, as a watchmaker knows the parts of a time-piece which he is entrusted to repair." And in relation to the importance of physics to persons generally, he says, "The laws of physics having an influence so extensive as appears from these paragraphs, it need not excite surprise that all classes of society are at last discovering the deep interest they have to understand them. The lawyer finds that in many of the causes tried in his courts, an appeal must be made to physics,—as in cases of disputed inventions; accidents in navigation, and travelling; disputes respecting steam-engines, and machines generally; questions arising out of the agency of winds, rains, water-currents, &c.: the statesman in Parliament is constantly listening to discussions respecting bridges, roads, canals, docks, telegraphs, and the mechanical industry of the nation; the clergyman finds everywhere among the facts of nature the most intelligible and striking proofs of God's wisdom and goodness; the sailor in his ship has to deal with one of the most admirable machines in existence; and soldiers, while studying how to defend their country, find its safety and its rank among the nations to depend greatly on the perfection to which their knowledge of physics has brought their rifled artillery (as made by Armstrong, Whitworth, and others), their iron-clad ships, and other parts of their military engineering; the landowner, in making improvements on his estates, buildings, draining, irrigating, road-making, &c.; the farmer, equally in these particulars, and in all the machinery of agriculture; the manufacturer, of course, to the widest extent; the merchant who has to purchase and distribute over the world the products of manufacturing industry—all these are interested in Physics; and even the man of letters, that he may not, in drawing illustrations from the material world, repeat the scientific heresies and absurdities which have heretofore prevailed, and which, by shocking the now better informed public, would lower the estimation in which literature would be held: and, lastly, parents of either sex, whose conversation and example have such powerful effect on the character of their children, quickly rising to be their successors;—all should have knowledge of physics, as one important part of their educational acquirements."

Notes.

Omnibuses.—The importance of omnibus locomotion to Londoners is illustrated by the fact that an average of no less than 137,000 passengers per day are carried by these vehicles. The statistics of metropolitan omnibus traffic are, for the half-year ending December, 1863:—Average number of omnibuses working daily, 583; of horses, 6,189; total number of miles run, 6,004,782; of passengers carried, 20,592,544; average receipts per mile run, 1s.; average fare per passenger carried, 3½d.; gross earnings for omnibus per day, £2 16s. 6d.; gross receipts during the half-year, £302,895 7s. 5d.; gross expenditure, £278,788 1s. 8d.; net profit (after allowing for a reduction in value of horse stock), £24,107 5s. 9d. The General Omnibus Company runs vehicles over 12,000,000 miles, and carries upwards of 41,000,000 passengers a year.

A Traveller in Italy writes:—"Obtaining refreshments when travelling is always attended with difficulty and discontent, even by rail; but always on Italian roads, by diligence or vetturino, it becomes most serious. I send you my experience, as it may be useful. Before leaving London I had an ordinary picnic basket, made of wicker work; in this was a tin box big enough for a chicken, a bottle of wine, tumbler, knives and forks, and a tea-making apparatus, the whole very compact, about 12 inches by 9 inches, and 6 inches deep; not at all too large to carry over one's shoulder. Where I slept, before retiring I ordered a chicken to be ready, cold, the next morning; and with this, wine and bread, a very fair dinner may be made on the road,—certainly immensely superior to the dirty, greasy, mutton cutlets which are the usual fare obtainable at short notice at a wayside inn."

Correspondence.

Memorial Tablets.—Sir,—I would submit, as a subject for a prize or prizes, to be offered by the Society of Arts, designs for memorial tablets to distinguished persons, to be affixed to houses in which they were born or dwelt. Records of this kind have been publicly mentioned several times of late years, and the public probably would now like to have the opportunity of seeing what could be done in this way, and the cost at which they could be obtained in different materials, as mosaic, majolica, metal, terra cotta, &c. Mosaic especially might seem promising in effect, having the advantage also of affording a test on a small scale, not only of its appearance in exterior decoration in London, but also of its durability in the London atmosphere. A public portrait in mosaic with an inscription would form a simple and interesting record, and such as people might be ready to erect if they knew the cost and saw the effect. In Kensington there is a house in which Sir Isaac Newton lived, which might well receive such a recording tablet.—I am, &c., Epsilon.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Medical, 8½. Mr. Teevan, "On some Injuries to the Skull.'
British Architects, 8.
Asiatic, 3.

Tues. ...Civil Engineers, 8. Mr. William Lloyd, "Description of the Santiago and Valparaiso Railway."
Statistical, 8. Mr. James Heywood, "The Resources of Brazil."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Prof. Helmholtz, F.R.S., "The Natural Law of Conservation of Energy."

Wed.... Society of Arts, 8. Mr. Thomas Webster, F.R.S., "On the Patent Laws."
Meteorological, 7.
R. Society of Literature, 4. Annual Meeting.

Thur. ...Society of Arts, 8. Cantor Lectures. Dr. Crace Calvert, "On Chemistry applied to the Arts—Animal Fatty Matters, &c."
Royal, 8½.
Linnæan, 8. 1. Dr. W. Baird, "On New Species, &c., of Annelids in the Collection of the British Museum." Rev. T. A. Marshall, "On the *Eumolphidæ*, a Group of Phytophagous Cleoptera."
Chemical, 8. Mr. J. T. Way, "Philosophy of British Agriculture."
Numismatic, 7.
R. Society Club, 6.
Royal Inst., 3. Prof. Helmholtz, "Natural Law of Conservation of Energy."

Fri.......Royal Inst., 8. Prof. Blackie, "On Lycurgus."
R. United Service Inst., 3. Major Talbot Harvey, "The Progressive and Possible Development of Infantry Drill and Manœuvres."

Sat ......R. Botanic, 3¾.
Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."
Antiquaries, 2. Annual Meeting.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

SESSION 1863.

467. New Zealand (Native Affairs)—Return (delivered 4th March)

Delivered on 8th March, 1864.

19. Railway and Canal, &c. Bills (195. Shrewsbury and Potteries Junction Railway; 196. Teign Valley Railway; 197. Ardrossan Harbour; 198. Bute Docks (Cardiff); 199. Exe Valley Railway; 200. Gloucestershire and Wiltshire Railway; 201. Llanelly Harbour Improvement; 202. Southampton and Netley Railway; 203. Waterford and Limerick, Limerick and Foynes, and Rathkeale and Newcastle Junction Railways; 204. Weald of Kent Railway; 205. Western super Mare Pier; 206. Whitby Water; 207. Hartlepool Port and Harbour; 208. Commercial Docks and Grand Surrey Docks and Canal; 209. Dublin and Baltinglass Junction Railway; Dublin and Belfast Junction Railway)—Board of Trade Reports.
90. General or Quarter Sessions (Middlesex, &c.)—Return.
100. Kertch Grant—Return.
65. Central Asia—Mr. Davie's Report.

Delivered on 9th March, 1864.

19. Railway and Canal, &c. Bills (210. Ilfracombe Railway; 211. Llynvi Valley and Ogmore Valley Railway; 212. Manchester and Milford Railway; 213. Much Wenlock and Severn Junction and Wenlock Railway Companies Amalgamation; 214. Rhymney Railway (Cardiff to Caerphilly, &c.); 215. Swansea Harbour Trust; 216. Vale of Crickhowell Railway; 217. Workington Harbour)—Board of Trade Reports.

Patents.

From Commissioners of Patents Journal, April 1st.

GRANTS OF PROVISIONAL PROTECTION.

Axles, lubricating of railway—753—W. A. Torrey.
Coal, hewing of—607—W. W. Burdon.
Engines, motive power—725—W. Home.
Gaseliers, &c., additions to—751—I. Barnes.
Mashing, apparatus for—745—C. Garton and T. Hill.
Scum, removing of—699—C. Heywood.
Sewing, &c., machinery for—215—L. Lindley and F. Taylor.
Ships, coating of—351—M. C. de C. Sinibaldi.
Sizing, dressing, &c., apparatus for—639—T. Parkinson, F. Taylor, and T. Burton.
Smoke valve—603—T. Boyle.
Spinning, machinery for—699—J. H. Albinson and J. Collier.
Woollen fabrics, &c., clearing blemishes from—629—L. A. Durrieu.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Railways, construction of—789—H. A. Bonneville.
Railways, &c.—832—C. D. Tisdale.

PATENTS SEALED.

2478. J. McInnes.	2508. J. E. Poynter.
2484. G. W. Reynolds.	2512. T. Scott.
2488. W. B. Fairbanks, J. Lavender, and F. Lavender.	2519. J. Milton.
2496. J. Heap.	2538. S. Berrisford and W. Ainsworth.
2498. T. Browning.	2539. J. Shanks.
2500. T. Fox.	2540. W. Hampson, jun.
2505. J. J. Anderton.	2564. J. Vaughan.
2506. J. Dodge.	2772. W. Clark.

From Commissioners of Patents Journal, April 5th.

PATENTS SEALED.

2524. R. Bewley, jun.	2602. John Weems.
2527. S. R. Smith.	2623. W. Betts.
2529. B. F. Weatherdon.	2628. F. B. Baker.
2531. J. Polglase and J. Cox.	2638. F. Parker.
2534. F. A. E. G. de Massas.	2669. M. Henry.
2536. S. Jay.	2685. W. Gadd, jun.
2550. F. de Wylde.	2695. J. Brigham and R. Bickerton.
2554. W. Fletcher.	2704. J. H. Brown.
2555. A. Budenberg.	2884. J. H. Johnson.
2566. W. Snell.	2927. J. H. Johnson.
2568. M. Pettenkofer.	34. G. T. Bousfield.
2579. T. C. Clarkson.	142. E. J. Vinot.
2580. J. Hinton.	156. J. Wilson.
2583. G. Howell.	318. G. T. Bousfield.
2588. Z. Colburn.	380. T. Jackson.
2596. A. A. Croll.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

841. R. B. Greenwood.	908. J. R. Cooper.
876. F. Taylor.	910. A. F. Delannoy.
909. J. Silvester.	911. G. Graham.
854. J. H. Johnson.	892. T. Don, T. Smith, and L. Horsfield.
858. H. Wilde.	899. J. M. Dunlop.
1009. E. H. Bentall.	903. J. Ward & R. Greenwood.
1027. E. H. Bentall.	906. J. C. Rivett.
1106. P. Wright.	978. J. Whitehouse.
872. J. Higgins and T. S. Whitworth.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

961. S. Clarke.	1028. T. N. Pengelly and G. Porter.
1896. J. J. H. Brianchon.	1369. C. Bartholomew and J. Heptinstall.
1046. P. McFarlane.	
1051. J. Rubery.	

Registered Designs.

Sash Fastener—4627—March 17—Hammond and Purrott, Croydon.
Shooting Jacket and Vest—4628—April 4—John Q. Bird, 13, Regent-street, W.
Revolving apparatus for Washing or Discharging Chemicals from Photographic Prints or Pictures—4629—April 8—George Williams, 1, Rhode-place, Holloway.
Perambulator and Sun and Rain Shade—4630—April 9—Henry Lloyd and J. H. Miles, Birmingham.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, APRIL 22, 1864. [No. 596. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

APRIL 27.—Adjourned Discussion on Mr. Webster's Paper on "The Patent Laws."

CANTOR LECTURES.

The next lecture on "Chemistry applied to the Arts" will be delivered by Dr. F. CRACE CALVERT, F.R.S., F.C.S., corresponding member of the Royal Academy of Turin, of the Société Industrielle de Mulhouse, of the Société Imperiale de Pharmacie de Paris, &c., on Thursday evening, at 8 o'clock, as follows:—

APRIL 28.—LECTURE V.—FLESH, its chief constituents, boiling, roasting, and preservation. *Animal black*, its manufacture and applications. The employment of animal refuse in the manufacture of *prussiate of potash. Prussian blue.* Manufacture of artificial animal manures.

MAY 5.—LECTURE VI.—ANIMAL LIQUIDS.—*Bile*, its purification and detergent properties. *Blood*, its application in the refining of sugar and the manufacture of albumen. *Albumen*, its use in calico printing and photography. *Urine*, its uses. *Milk*, its composition properties, falsification, and preservation. A few words on putrefaction.

ALBERT MEDAL.

The Gold Medal established by the Society in memory of its late President, the Prince Consort, to be called the "Albert Medal," and to bestowed, from time to time, "for distinguished merit in promoting Arts, Manufactures, and Commerce," has been adjudged to Sir Rowland Hill, K.C.B., in recognition of his eminent services to all classes of the community in the creation of the Penny Postage System and other Postal reforms.

DWELLINGS OF THE LABOURING CLASSES.

Referring to the resolutions passed by the Council, on the 16th of March, and printed in No. 591 of the *Journal*, the Council have fixed the Conference on this subject for Thursday and Friday the 26th and 27th of May, at 11·30 each morning, and the following letter of invitation is about to be issued:—

SIR,—The Council have recently been invited to turn their attention to a subject of the gravest importance, viz., the present condition of the Dwellings of the Labouring Classes. At a meeting of the Society, held on Wednesday evening, the 9th December last, Mr. J. C. Morton read a paper on "Agricultural Progress; its Helps and its Hindrances." During the discussion arising upon this paper, the subject of Labourers' Cottages was touched upon, but it was thought to be of such great importance as to demand the special consideration of the Society, and the Council have since given their anxious attention to the consideration of this matter at several of their meetings. During the past century the Society has frequently occupied itself with questions of a similar character, has, on more than one occasion, offered prizes for designs and estimates for Dwellings for the Labouring Classes, has collected statistics connected with their construction, and has now before it sets of plans sent in, in competition for Mr. Denton's and the Society's Prizes; but the improved and cheaper construction of dwellings is only a small portion of this complicated subject. The Council therefore propose to submit this subject to discussion at a Special Conference, to be held here on Thursday, the 26th of May, and the following day.

To this Conference the Council invite all those members of the Society of Arts who have seats in the Legislature, such other members as are known to take a special interest in the subject, the Presidents of the Institutions in Union with the Society, and other noblemen and gentlemen whose co-operation may be deemed important.

The Conference each day will be opened at 11·30 *precisely*, and closed not later than 4 o'clock, the chair being taken by the Chairman of the Council.

The discussion will be taken:—

1. On the insufficient number of habitations for the Labouring Classes in Town and Country.

2. On the badness of the existing accommodation.

3. On the effects arising from this state of things, viz.:—
   - (*A*) Religious, moral, and social.
   - (*B*) Sanitary.
   - (*C*) Economic.

4. On the causes to which these evils may be, or have been, attributed, such as—
   - (*A*) The Law of Settlement.
   - (*B*) The Poor Laws.
   - (*C*) Tenure of Property, such as mortmain, leasehold system, tenancy for life, &c.
   - (*D*) Legal difficulties affecting the Transfer of Property.
   - (*E*) Difficulty of providing proper Dwellings at a cost which will be remunerative to Capital in Town and Country.

5. Remedies:—
   - (*A*) What can be done by Legislation?
   - (*B*) What can be done without Legislation?
   - (*C*) What assistance, if any, can the Society give in either of these directions?

The Council hope to hear from you that you will attend the Conference, and take part in its deliberations.

I have the honour to be, Sir,
Your obedient Servant,
P. LE NEVE FOSTER,
Secretary.

The Council have appointed the following Committees:—

A Committee to consider and report what memorials should record the sites of the Exhibitions of 1851 and 1862, which were originated by the Society, such Committee to consist of—The Chairman of the Council; Earl Granville: Sir C. W. Dilke, Bart.; Sir J. Paxton, M.P.; Capt. Fowke, R.E.; Messrs. H. Chester; H. Cole, C.B.; Warren De la Rue, F.R.S.; G. Godwin, F.R.S.; P. Graham; Owen Jones; John Kelk; F. Lawrence; M. H. Marsh, M.P.; Marsh Nelson; S. Redgrave; Gilbert Scott, R.A.; Sydney Smirke, R.A.; T. Winkworth, and M. Digby Wyatt.

A Committee to consider and report how the Society may promote the erection of statues or other memorials of persons eminent in Arts, Manufactures, and Commerce, and whether it is desirable that the Society should contribute to the monuments of distinguished individuals, members of the Society; such Committee to consist of—The Chairman of the Council; Earl Stanhope; The Right Honourable Wm. Cowper, M.P.; Lord H. G. Lennox, M.P.; Sir Joseph Paxton, M.P.; Messrs. Bodkin; H. Chester; H. Cole, C.B.; C. Wren Hoskyns; Edward Hamilton; F. Lawrence; S. Redgrave, and T. Winkworth.

The Artistic Copyright Committee met on Tuesday last, to consider what steps should be taken in reference to Mr. Black's Bill for the consolidation and amendment of the Acts relating to Copyright in Works of Literature and the Fine Arts. The Committee approved generally of the objects of the Bill, but considered that the details required careful revision, and they directed a communication to be made to Mr. Black to that effect, with a request for an interview with that gentleman, to which he has consented.

The following Institution has been received into Union since the last announcement:—

Hunslet (near Leeds) Mechanics' Institute.

Prizes for Art-Workmen.

The Council of the Society of Arts hereby offer prizes for Art-Workmanship, according to the following conditions:—

I. The works to be executed will be the property of the producers, but will be retained for exhibition, in London and elsewhere, for such length of time as the Council may think desirable.

II. The exhibitors are required to state in each case the price at which their works may be sold, or if sold previous to exhibition, at what price they would be willing to produce a copy.

III. The awards in each class will be made, and the sums specified in each class will be paid, provided the works be considered of sufficient merit to deserve the payment; and, further, in cases of extraordinary merit additional awards will be given, accompanied with the medal of the Society.

IV. Before the award of prizes is confirmed, the candidates must be prepared to execute some piece of work sufficient to satisfy the Council of their competency.

V. *Bona-fide* Art-workmen only can receive prizes.

VI. All articles for competition must be sent in to the Society's house on or before Saturday, the 26th of November, 1864, and must be delivered free of all charges. Each work sent in competition for a Prize must be marked with the Art-workman's name, or, if preferred, with a cypher, accompanied by a sealed envelope giving the name and address of the Art-workman. With the articles, a description for insertion in the catalogue should be sent.

VII. Although great care will be taken of articles sent for exhibition, the Council will not be responsible for any accident or damage of any kind occurring at any time.

VIII. Prices may be attached to articles exhibited and sales made, and no charge will be made in respect of any such sales.

IX. All the prizes are open to male and female competitors, and in addition, as regards painting in porcelain, decorative painting, and wall mosaics, a second set of prizes of the same amounts will be awarded among female competitors. If a female desires to compete in the female class only, she must declare her intention accordingly. The originals of the works prescribed may be seen at the South Kensington Museum, in the gallery at the entrance to the Sheepshanks pictures.

Casts may be seen at the Society of Arts, Adelphi, London, and the Schools of Art at Edinburgh, Dublin, Manchester, Glasgow, Birmingham, and Hanley in the Potteries.

Photographs, engravings, &c., may be purchased at the Society of Arts, John-street, Adelphi, at the prices named.

*** The Council are happy to announce that several of the works which received first prizes in the competition of 1863, have been purchased by the Department of Science and Art, to be exhibited in the South Kensington Museum and the Art Schools in the United Kingdom.

1st Division.

Works to be Executed from Prescribed Designs.

For the successful rendering the undermentioned designs in the various modes of workmanship according to the directions given in each case. Chromolithographs, woodcuts, photographs, and casts of such designs, will be sold at the Society's house at cost price.

Class 1.—Carving in Marble, Stone, or Wood.

(*a.*) *The Human Figure.*—One prize of £15 for the best and a second prize of £7. 10s. for the next best work executed in marble or stone, after the Boy and Dolphin cast from a chimney-piece, ascribed to *Donatello.* Original in the South Kensington Museum, No. 5,896. Dimensions to be one-eighth less than the cast.

[Cast—Fifteen shillings. Photograph—One shilling.]

(*b.*) *Ornament.*—One prize of £10 for the best and a second Prize of £5 for the next best work executed in marble, stone, or wood after a carved chair-back in the possession of Henry Vaughan, Esq. Dimensions to be two-thirds of the cast.

[Cast—Twelve shillings. Photograph—One shilling.]

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c. Ornament.—One Prize of £10 for the best, and a second Prize of £5 for the next best work executed in stone, after a *Gothic bracket* in the Architectural Museum. Dimensions the same as the cast. In this design the details may be improved by the introduction of small animals, and the human head may be changed according to the taste of the art-workman.

[Cast—Ten shillings; Photograph—One shilling.]

(*d.*)—One prize of £20 for the best, and a second prize of £10 for the next best, work carved in *wood* after a design by *Holbein*, as an *Inkstand* or *Watch-Holder* on three feet. Diameter of body to be eight inches.

[Wood Engraving—Sixpence.]

(*e.*)—One prize of £15 for the best, and a second prize of £7 10s. for the next best, work carved in wood after the *Head of a Harp* of the period of Louis XVI., in the South Kensington Museum, No. 8531. The head and bust only need be fully completed. Dimensions the same as the cast.

[Cast—Thirty shillings; Photograph—One shilling.]

(*f.*) *Ornament.*—One prize of £10 for the best, and a second prize of £5 for the next best work carved in wood after an *Italian picture frame* in the possession of Henry Vaughan, Esq. Dimensions—Twelve inches high, sight measure.

[Photograph—Two shillings.]

Class 2.—Repoussé Work in any Metal.

(*a.*) *The Human Figure as a bas-relief.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Raphael's* "*Three Graces.*" Dimensions—The figures to be six inches high.

[Photograph—One shilling.]

(*b.*) *Ornament.*—One prize of £5 for the best and a second prize of £3 for the next best, work executed after a Flemish salver in the South Kensington Museum, date about 1670, No. 1153. Dimensions—Twelve inches in diameter.

[Photograph—One shilling.]

Class 3.—Hammered Work, in Iron, Brass, or Copper.

Ornament.—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed after the portion shown in the Photograph of the Pediment of a Gate (German work, date about 1700,) in the South Kensington Museum, No. 5979. To be adapted for use as a bracket. Dimensions—12 inches deep.

[Photograph—One shilling and threepence.]

Class 4.—Carving in Ivory.

(*a.*) *Human Figure in the round.*—One prize of £15 for the best and a second prize of £10 for the next best, work executed after an *Ivory*, by *Fiamingo*, in the possession of John Webb, Esq. Dimensions—the same as the cast.

[Cast—One Shilling.]

(*b.*) *Ornament.*—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed after a pair of *Tablets*, in the possession of John Webb, Esq. Dimensions—the same as the cast.

[Cast—One Shilling.]

Class 5.—Chasing in Bronze.

(*a.*) *The Human Figure.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after a reduced copy of "*Clytie.*" A rough casting in bronze, on which the chasing must be executed, will be supplied by the Society at cost price.

[Plaster Cast—Three shillings and sixpence.]

(*b.*) *Ornament.*—One prize of £10 for the best and a second prize of £7 10s. for the next best, work executed after *Goutier*, from a cabinet in the possession of Her Majesty the Queen. A rough casting in bronze, on which the chasing must be executed, will be supplied by the Society at cost price.

[Plaster Cast—One shilling.]

Class 6.—Etching and Engraving on Metal—Niello Work.

Ornament.—One prize of £10 for the best and a second prize of £5 for the next best, work executed after arabesques by Lucas Van Leyden, 1528. No. 18,968 in the South Kensington Museum. To be engraved the height of the photograph, and, if round a cup or goblet, repeated so as to be not less than nine inches in length when stretched out.

[Photograph—Sixpence.]

Class 7.—Enamel Painting on Copper or Gold.

(*a.*) *The Human Figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Raphael's design of the* "*Three Graces,*" executed in *grisaille.* Dimensions—The figures are to be four inches high.

[Photograph—One shilling.]

(*b.*) *Ornament.*—One prize of £5 for the best and a second prize of £3 for the next best, work executed after a German arabesque (16th century). No. 19,003 in the South Kensington Museum. Dimensions—The same as the Engraving.

[Photograph—Sixpence.]

Class 8.—Painting on Porcelain.

(*a*) *The Human Figure.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Raphael's* "*Two Children,*" in the cartoon of "*Lystra.*" Dimensions—the same as the Photograph. This work is to be coloured according to the taste of the painter.

[Photograph—Ninepence.]

(*b.*) *Ornament.*—One prize of £5 for the best and a second prize of £3 for the next best, work executed after arabesques by Lucas Van Leyden, 1528, No. 18,968 in the South Kensington Museum, and coloured according to the taste of the painter. Dimensions—Double the size of the Photograph.

[Photograph—Sixpence.]

N.B.—See conditions, Section IX.

Class 9.—Decorative Painting.

(*a.*) *Ornament.*—One prize of £5 and a second prize of £3 for a work, executed after an *ornament*, from *Castel R. Pandino*, near Lodi, from a drawing in the South Kensington Museum, No. 1150. Dimensons—length 4ft.—width, enlarged from the print in the same proportion.

[Coloured Print—One Shilling.]

(*b.*) *Ornament.*—One prize of £5 and a second prize of £3 for a work, executed after a *picture frame*, in the South Kensington Museum, No. 7820. Dimensions—5 feet by 3 feet 11½ inches, outside measure. The works to be executed on canvass, either with or without stretchers in cool colours. Some lines of the mouldings may be gilt.

[Photograph—One shilling and sixpence.]

N.B.—See conditions, Section IX.

Class 10.—Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.

Ornament.—One prize of £5 for the best and a second prize of £3 for the next best, work executed after a specimen in the possession of the Hon. John Ashley. Dimensions—one-third larger than the Lithograph.

[Outline Lithograph—One shilling.]

Class 11.—Cameo Cutting.

(*a.*) *Human Head.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Wyon's* heads of the Queen and the Prince Consort, on the Juror's medal of 1851.

(*b*) *Animal.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Wyon's* "*St. George and the Dragon,*" on the Prince Consort's medal. Dimensions the same as the casts.

[Casts—Sixpence each.]

Class 12.—Engraving on Glass.

Ornament.—One prize of £5 for the best and a second prize of £3 for the next best, work executed after arabesques by Lucas Van Leyden, 1528. No. 18,968 in the South Kensington Museum. To be engraved the height of the engraving; and if round a glass or goblet, repeated so as to be not less than 9 inches long when stretched out.

[Photograph—Sixpence.]

Class 13.—Wall Mosaics.

Human Head.—One prize of £15 for the best and a second prize of £10 for the next best, work executed after *Bertini,* of Milan. A preparatory drawing must be made, coloured, after the lithograph, on which the lines and disposition of the Tesseræ must be marked. The dimensions of the work to be regulated by the size of the Tesseræ proposed to be used, which size may be left to the choice of the artist. Although desirable, it is not necessary to execute the whole subject in actual mosaic, but if a part only be done, the eye must be in such portion. A coloured drawing, with Tesseræ, may be seen at the Society's house, and in the South Kensington Museum, and Tesseræ of two sizes may be obtained from Messrs. Minton, Stoke-upon-Trent, and Messrs. Maw and Co., Brosely, Shropshire.

[Lithograph Outline Coloured—Two Shillings.]

N.B.—See conditions, Section IX.

Class 14.—Gem Engraving.

(*a.*) *Human head.*—One prize of £10 for the best and a second prize of £5 for the next best work executed after an original in the possession of John Webb, Esq. Dimensions—the same as the cast.

[Cast—Sixpence.]

(*b.*) *Full-length figure.*—One prize of £10 for the best and a second prize of £5 for the next best work executed after an original in the possession of John Webb. Esq. Dimensions—the same as the cast.

[Cast—Sixpence.]

Class 15.—Die Sinking.

Human head.—One prize of £10 for the best, and a second prize of £5 for the next best work executed after the head of the Prince Consort, by *Wyon*, on the Society's medal. Dimensions half the size of the original.

[Cast—Sixpence.]

Class 16.—Glass Blowing.

Ornament.—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed after an original in the South Kensington Museum, No. 1813.—Dimensions as given in the wood engraving.

[Engraving—One shilling.]

Class 17.—Bookbinding and Leather Work.

(*a.*) *Bookbinding.*—One prize of £7 10s. for the best and a second prize of £5 for the next best work executed in bookbinding, after an Italian specimen in the South Kensington Museum, No. 7,925. The work to be bound should be some classical author of the size given. Dimensions—the same as the photograph.

[Photograph—One shilling.]

(*b.*) *Leatherwork.*—One prize of £7 10s. for the best, and a second prize of £5 for the next best work of boiled and cut leatherwork for the outside covering of a jewel casket. Original in the South Kensington Museum, No. 7768. Dimensions—one-third larger than the photograph.

[Photograph—One shilling.]

Class 18.—Embroidery.

Ornament.—One prize of £5 for the best and a second prize of £3 for the next best, work executed either after a German example in the Green Vaults at Dresden, or an Italian Silk in the South Kensington Museum, No. 7468, which may be adapted to a screen. Dimensions, according to the taste of the embroiderer.

[Photograph—German, Sixpence; Italian, One shilling.]

*** The plaster casts may be obtained from D. Brucciani, 39, Russell-street, Covent-garden, W.C.

2nd Division.

Works to be Executed without Prescribed Designs.

Wood Carving.

(*a.*) *Human figure in alto or bas relief. Animals or natural foliage may be used as accessories.* 1st prize of £25 and the Society's Silver Medal. 2nd prize of £15. 3rd prize of £10.

(*b.*) *Animal or still-life. Fruit, flowers, or natural foliage, may be used as accessories.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

(*c.*) *Natural foliage, fruit, or flowers, or conventional ornament in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

(By Order)
P. LE NEVE FOSTER, *Secretary.*

Proceedings of the Society.

Eighteenth Ordinary Meeting.

Wednesday, April 20th, 1864; Sir Thomas Phillips, F.S.S., Vice-President of the Society, in the chair.

The following candidates were proposed for election as members of the Society:—

Gatliff, Charles, 19, Coleman street, E.C.
Heinrich, Johann, 36, Lower Kennington-lane, S.
Stokes, Charles, 65, Brook-street, Hanover-square, W.

The following candidates were balloted for and duly elected members of the Society:—

Bourne, Stephen, Examiner's-office, H.M. Customs, E.C.
Croskey, Joseph Rodney, Warwick-house, Maida-hill, W.

Lawson, Archibald Scott, 1, John-street, Bedford-row, W.C.

AND AS HONORARY CORRESPONDING MEMBERS.

Lancia di Brolo, Le Duc, Palermo.
Venturini, Le Commandeur Charles, Ancona.

The Paper read was—

ON THE PATENT LAWS.

BY THOMAS WEBSTER, M.A., F.R.S., BARRISTER-AT-LAW.

The Council of the Society having suggested that a discussion on the Patent Laws might be of service during the present session, I have much pleasure in preparing a communication for the purpose of facilitating the full consideration and discussion of the subject.

It is one of the peculiar characteristics of this ancient Society—the first and for a long time the only representation of practical science—that its comprehensive character permits it to take the lead in any movement relating to the Arts, Manufactures, or Commerce of the country. The committee to which "The Patent Law Amendment Act, 1852" is due met first in the house of this Society. Other committees of the Society have from time to time reported on this subject in the years 1850, 1851, and 1852, and the recent communication of the chairman of your Council to the Social Science Association, at its meeting last year, at Edinburgh, is a valuable contribution to the history of the progress of opinion on this subject.

It is not my intention on the present occasion to treat of the general jurisprudence of the subject, by entering on an elaborate discussion of the origin or grounds of the principles upon which property in the exhibition of mind, as embodied in material forms, may be considered to rest. The origin of such property, the grounds upon which it rests, whether on natural right, on policy, or expediency, the protection of such property by laws of the land, without which the name of property is but an empty sound, have been repeatedly treated of.

My object on the present occasion is to treat the subject practically in reference to the general policy of the patent laws, and with the view of ascertaining facts and eliciting opinions on certain questions which the consideration of the policy of those laws involves. That the subject has difficulties peculiarly its own is not to be denied; whether such difficulties may be greatly modified and lessened, if not altogether removed, is one of the questions at issue. Hitherto no attempt has been made to grapple with these difficulties, the provisions for this purpose contained in the Patent Law Amendment Act having remained in abeyance.

Considerable differences of opinion may be expected as to the most appropriate remedies for the admitted grievances, but I believe that should the discussion of the subject be fully exhausted there will be a great preponderance of opinion in favour of the views with which the Patent Law Amendment Act of 1852 was proposed and supported.

In entering on this subject it will be convenient to premise that the real question at issue may be considered under the following heads:—1. Whether inventions should be encouraged and inventors rewarded. 2. Whether any more practicable means of encouraging inventions and rewarding inventors exist than a system of patents. 3. The best means of creating and protecting such property. No one, to my knowledge, has yet advanced so far in liberalism as regards the rights of property or the encouragement of inventions, as to deny or seriously dispute all those propositions. Such heresy, so to speak, has not broken out into open flame, however it may be smouldering, and appear to be involved in the ashes of doctrines which have occasionally been announced, or underlie the surface of opinions which have been advanced, and will come under discussion on the present occasion. The President of the British Association (Sir W. Armstrong), at Newcastle, and your Chairman of Council (Mr. Hawes), in the paper already referred to, give expression to the opinion that the seeds of invention strewn broadcast over the world by the previous investigations of learned men, are published and given to the world, ready to germinate in due season whenever the occasion or necessity may arise, and that legislative interference will neither produce them nor stimulate their growth. This opinion, proceeding from, or endorsed by, such authority has been, and will be, often quoted as condemnatory of all views favourable to property in invention, and in support of the views that invention does not require the stimulus of the reward or remuneration which the Patent Laws are designed to confer. From these premises it is contended that new processes or new mechanical contrivances, derived from information thus freely and gratuitously published, are public property, and cannot belong to those who merely give such knowledge a practical form. But is not this to beg the whole question? Is there not also some confusion arising from the use or imperfection of language? Is a proper distinction always maintained between discovery and invention in reference to these questions? A law of nature, as gravitation, or a machine, as the steam-engine, or a process, as vulcanising, are spoken of indifferently as discoveries or inventions. This confusion of language is fruitful of difficulty in the subject under consideration. We speak of discovering a law of nature, as gravitation, cohesion, elasticity, attraction, heat, atomic theory, equal transmission of pressure in fluids, elastic and inelastic; we discover (Fr. *découvrir*) that which has a prior or actual existence in nature; we do not invent such laws. In the proper sense of the term, invention is more in the nature of creation than of discovery. We invent or find out a mode of doing, that is, of producing a particular thing; every new manufacture is in that sense a creation. To call it a discovery is to introduce a confusion in the use and application of terms; or, to add one further illustration, we speak of the discovery of vaccination and of the invention of the penny postage, neither of which could be the subject of the patent laws. The inventor applies the laws of nature; invention consists in the application of such laws. For instance, Watt's invention of the steam engine was an application of the laws of heat; Dollond's achromatic object-glass, of the laws of light; Wollaston's camera-lucida, of the laws of refraction and total reflection. Vulcanised rubber was a new creation; such a thing had never existed before, the invention consisting in the application of heat and sulphur to rubber under certain conditions. Photography was an invention in the strict sense of the term; such a picture, *i.e.*, a picture so produced, was a new creation, a new manufacture. The self-acting mule, the product of the genius of Richard Roberts, whose loss we so recently have had occasion to deplore, the regenerative furnace of Siemens, the automatic self-recording telegraph, the last production of Professor Wheatstone, the various forms of telegraph or telegraphic cables, may with propriety be called new creations, or, in the language of the Patent Law, new manufactures. Seeing, then, that invention consists in the application of the laws of nature to the matter provided to our hands, and in giving to such laws a practical form, how can it be said that property cannot be acquired in the application of knowledge given to the public? That is the very foundation of the system. The distinction above adverted to is more important than may at first sight appear. The correct and appropriate use of terms is a matter at all times deserving consideration, but especially so when it is the foundation of distinctions in reference to the subject under consideration. Thus, for example, M. Legrand, insisting on the distinction between patent right and copyright, on the incontestible difference between the work of the writer or author of a literary composition and the inventor, says, "If Massillon had not written *Le Petit Carême* no other person could have done it. If, on the contrary, Niepce had not discovered photography, some one else would have invented it. What do we say? Another ha invented it. Daguerre has had the same idea. Artist

really create something, they produce work which no other would have produced. In the domain of industry, on the contrary, the inventor is not, properly speaking, any more the creator than he could be the exclusive possessor. He finds; he discovers; but he does not create."* The confusion of the above needs little comment; an idea not carried out is no invention. It is matter of law that a patent cannot be granted for a principle or an idea, but only for its application or embodiment; thus there could be no patent for the discovery of a law of nature or property of matter, unless applied or embodied in a manufacture. In litigated cases the question whether the subject of the patent is a principle or a manufacture, not unfrequently arises. The following observations of a highly scientific and most learned man, Mr. Baron Alderson, are worthy of special attention: "I have always thought that the real test was this, that in order to discover whether it is a good or a bad patent, you should consider that what you cannot take out a patent for must be considered to have been invented *pro bono publico*—that is to say, the principle must be considered as having had an anterior existence before the patent. Now supposing in Watt's case it had been known that to condense in a separate vessel was a mode of saving fuel, then Watt certainly could have taken out a patent for carrying into effect that principle by a particular machine; but then his patent would have been for a machine; and if I invented a better machine for carrying out the principle I should not infringe his patent unless my machine was a colourable imitation."

The distinction now insisted on is little regarded by many who speak of patenting ideas and principles, and derive an argument from the abuse rather than the use of the system, and assume that to be part of the system which by law is illegal.

But it is said that inventors need no such encouragement, that invention is a real pleasure; that true inventive genius labours on involuntarily; that the glory of a great name or the possible reward of a grateful nation is a sufficient stimulus; that the philosopher, physician, and chemist give their results to the public, who appreciate originality of mind, and do not fail to reward it. All this may be true, but it applies to the labourer in the field of discovery rather than of invention. I remember on one occasion, at a meeting at Manchester, when this doctrine was propounded, that Richard Roberts replied: "The patterns of that paticular invention cost me £500; they would have been 'colted' (that is, copied) the next day but for the Patent Laws." The gratitude of the public is soon exhausted when the benefit is reduced into possession.

However great may be the stimulus of the pleasure of invention the advocates of this view would appear to lose sight of or disregard the fact that the invention and the public require adaptation to each other; that the introduction of an invention involving any material change is a constant struggle with the existing state of things, and in a large class of cases is as much an education as the training and introduction of a child; that it is a contest with existing practice, in which contest the inventor has to struggle with all the prejudices, capital, and influence of the existing trade and established manufacture. The history of the struggles of the introduction of new inventions, as detailed on the hearings before the Judicial Committee of the Privy Council in cases of application for the extension of the terms of patents, can hardly fail to produce the conviction that these struggles would never have been undergone but for the expectation of the reward. Many inventions are wholly in advance of the age, and would fall still-born but for the return anticipated on the capital embarked in their introduction. There was, it is said, no patent for paper (A.D. 1200), or for oil (1297), or for glass (1300), or for the mariner's compass (1302), or for printing (1430), or for gunpowder (1450), or for many other useful inventions of world-wide utility, and therefore it is left to be inferred that encouragement to invention or reward to the inventor in the nature of the patent system is unnecessary. Until the wants of mankind or the isolated efforts of mighty minds in the progress of civilization had formed the alphabet, so to speak, or laid the foundation of practical arts, there was nothing out of or upon which the superstructure could be raised. Because skins or the hand-made fabric once served for clothing can it be contended that the progress of industry and of the practical arts has not been most materially stimulated by the expectation, however delusive, of reward and pecuniary remuneration?

Books were compiled and written before and without any copyright laws, but does any one adduce this as an argument against the justice or expediency of these laws, the analogy of which to the patent laws can hardly be denied, notwithstanding the distinctions which may be drawn between them? It is said that things belonging to the province of copyright are an embodiment of the individual mind, which no other mind would have made, whereas things belonging to the province of patent right are capable of being made by many minds, of being originated in the same identical form by a plurality of persons—that the inventor has, in fact, only forestalled time, and that it may be presumed that the invention would have been made at some time by some other person, and would certainly have been made so soon as the want should arise—that to infringe copyright is slavishly to imitate, whereas patent right may be infringed without such imitation. The subject of copyright is one specific combination of words, letters, and lines, in this respect similar or analogous to the specific combination constituting a machine, or to elements arranged in a certain order, whereas in many cases inventions may be exhibited in various material forms, carrying out or subservient to one leading idea. Different minds do not hit on the same means for carrying out the same idea or of attaining the same object. Invention is one continuous process of simplification, as the history of invention clearly shows. In cases of copyright the identification is easy, speaking to the eye or the ear, whereas in cases of patent right the identification is sometimes difficult, inasmuch as, to the eye, the material forms may be different. These distinctions point only to the difficulties of the subject, and must be dealt with accordingly; but the principle of property in both is the same, namely, a recognition of right in the product of the brain, as embodied in a material form. Invention being one continual progression, each stage in advance of the preceding cannot fail, in many cases, to provoke the opposition of the capitalist, who may look with little favour on the changes which a great improvement necessitates; his old mill may have to be refilled with new machinery. Again, the capitalist in mind, who can devise an expedient for overcoming any difficulty so soon as it arrives, may not be pleased by finding that he has been forestalled by some other person; that he must respect the property which the law gives to possession, and adopt some other, and perhaps inferior, means of attaining the same end, or come to terms with the owner of that property. Hence, patents have been called obstructive, likened to toll-bars on the highway. Authentic instances of such obstruction would be a great boon, and contribute much to the history of the subject; they have been often asked for, very few have ever been even pointed at. If such exist to the extent contended for, or to any extent, the remedy is very simple—make a license under a patent a matter of compulsory purchase, to be settled by arbitration on a review of all the circumstances of the case. If the owner of land or houses has to restore to the public a portion of the ancestral property acquired from the public in former times, there can be no great injustice in requiring a patentee, on fair and proper terms, to admit others to share in that which he may be regarded as having acquired from the public; in this sense that same other person, it may be presumed, would have made the invention when the emergency arose. The patent might be granted on this

* See "The Patent Question," p. 17, by R. A. Macfie, papers at Edinburgh Meeting of Social Science, 1863.

express condition, and the effect of such a system immediately tried. But philanthropic and moral considerations are introduced. The system is denounced as a lottery, and injurious to the personal interests of the inventor, who rarely obtains the reward which he expects or to which he may be fairly entitled. Is this not part of the lottery of life? The race is not always to the swift nor the battle to the strong. The very objection assumes an expenditure of time, labour, and money in producing a result beneficial to the public though not to the individual author. Let such an individual be rewarded out of the "Inventors' Fee Fund," the surplus fund to which he has contributed. Let this blot be removed. Let it not be said that a great benefactor to the public has been unrewarded, when ample funds exist of the inventor's own creation, out of which he may be amply compensated. Let it not be said that the name of one of our greatest inventors, just removed from amongst us, Richard Roberts, should be without a national tribute for the emancipation and development of industry of which the self-acting mule was the pioneer, or that the family of the man should be permitted to want in the midst of the untold millions which his inventions have added to individual and national wealth.

But the principle of patents is said to be inconsistent with the principles of free trade. Here again, I cannot but think there is some misconception and confusion in the use of language. The theory of the patent law is the creation of a trade, or, as expressed in one of the earliest reported cases, "when any man, by his own charge and industry, or by his own wit or invention, doth bring any new trade into the realm, or any engine tending to the furtherance of a trade, that never was used before, and that for the good of the realm, the king may grant him a monopoly patent for some reasonable time until the subjects may learn the same, in consideration of the good that he doth bring to the commonwealth, otherwise not."* It has been said that these principles are not now applicable; that all trades are established and that the reason does not apply, there being no necessity for the instruction; but such an observation is made regardless of the fact that knowledge and invention are progressive; that if there be not the same ignorance as in bye-gone centuries, there is a special opposition, which our very civilization has created, rendering the special property in an invention the best means hitherto desired, if not the only means, for ensuring that progress which all profess to desire. It may then be assumed, that new trades, or improvements in existing trades, which, for the question under consideration, may be regarded as new trades, are still to be created, and that it is the object of the patent laws to foster inventions constituting such new trade. The fostering care of special property in the invention is continued only for a limited and reasonable period, until the trade shall have been established; during that period the particular trade is not to be practised or special property shared without its owner participating in the proceeds; when that period has expired, the trade, whether established or not, is open to all, with this further advantage that a description of the manner of practising the invention is open to all; the requirement of such a description—called the specification—having been substituted in the reign of Queen Anne, in lieu of a proviso appearing in some private Acts for patents requiring the patentee, during the latter half of the term granted, to take apprentices and teach them the knowledge and mystery of the said new invention.†

The principles of free trade can have no application to a trade which is non-existent or which has to be created. If, as the theory assumes, special property in an invention be essential or materially conducive to the creation of the trade, to prohibit such property is to prevent or delay the establishment of the trade. The supporters of this objection would appear to confound patents for inventions with the exclusive privileges declared to be illegal by the Statute of Monopolies (21 Jac. I., c. 3, A.D. 1624). It is contrary to the principles of free trade to restrain any person from, or subject him to a tax for practising, any existing trade as a baker or brewer, or buying and selling in the cheapest market, but it can hardly be said to be contrary to the principles of free trade to give exclusive privileges for the creation of that which does not exist, for a trade to become free as soon as established.

The real question would appear to be as to the terms or conditions upon which such privileges should be granted, and not to the principle of such privileges. If patents are granted improvidently, there is an abuse of the system; remove the abuse, but do not found on the abuse an argument against the use of a system, unless such abuse is incurable and inevitable.

The abolition or diminution of secret practices, with their long train of attendant evils, has frequently been relied on as an argument in support of the patent system; and the freedom with which the knowledge of inventions is now given to the world, has been relied upon as one of the great improvements due to the passing of the "Patent Law Amendment Act, 1862." This, however, in the able paper of the chairman of your Council on the economical effect of the patent laws, is objected to as inducing the circulation all over the world of the best possible descriptions of our most recent improvements for the benefit of our rivals. Is this generosity really detrimental to our national interests? Can any well-authenticated instances of that detriment be adduced? Isolated cases may exist in which some particular interest may, under special circumstances and for a limited time, be prejudiced. This is a practical test, and capable of proof; and if it should appear that in some few cases the result may be that the foreign manufacturer, by means of such information, may be enabled to compete successfully with the home manufacturer, either at home or in the markets of the world, are not the compensating advantages such as greatly to outweigh or overbalance the supposed detriment? Is such detriment in any respect comparable to the evils of the secret system of the guilds of our forefathers, when art was a mystery and trade a protected monopoly?

Are not the objections, when thoroughly examined, directed to the administration rather than to the principle of the system? Is not the proper course to reform the system, at least to make the attempt?

Time will not permit me to pursue this part of the subject in detail on the present occasion; it may be sufficient to point to the proposals which have been made for removing or mitigating the admitted evils of the present system, and which may be classed as follows:—

1. That patents should not be granted as of course, but that some check should be placed on their indiscriminate issue by a preliminary inquiry and report, by which the applicant would receive the benefit of the accumulated experience of the office of the Commissioners of Patents in consideration of the fees paid.

2. That the validity and infringement of patents should be tried by a judge, assisted by two or more assessors conversant with the subject selected by the parties or by the judge, from a panel provided for the purpose.

3. That the owner of a patent should be required to grant licenses, or to sell the whole right for the benefit of the public, on adequate consideration.

4. That the fees paid on patents should constitute an "Inventors' Fee Fund," to be applied wholly to inventors' purposes, to the reward of meritorious inventors, to the repurchase of patent rights, and the advance of practical science.

DISCUSSION.

Mr. Robert Wilson would say a few words on the im-

* See 1 Webster, "Patent Cases," p. 6.

† See Act for Bank's Invention, A.D. 1651, c. 2; 1 Webster, "Patent Cases," p. 35.

provement of the existing patent laws, rather than go into the more abstract question whether those laws were expedient in themselves. For his own part he could not see how they could expect to maintain invention if they deprived it of its reward. In his opinion the first question to be considered was whether they could amend the existing laws: and he thought it possible to do so in many important respects. One great improvement would be to enforce precision in the specification of the invention. It was a condition in every patent that the patentee should within six months file a specification describing his invention, and the manner in which it was to be carried into effect. But how was this complied with? In a large number of cases at the present day patents were taken out, not for things entirely new, but for modifications of existing inventions, and in such cases he submitted the description might clearly distinguish what was new from that which was old. But those who were conversant with the subject knew that such was not the case, for it constantly happened that patentees put in descriptions which did not distinguish clearly the new from the old, but left it to the public to pick it out themselves, instead of saying "the old machine is defective in certain points, and I have introduced a certain improvement," and then described the whole machine, pointing out distinctly the improvement which he sought to introduce and make the subject of his patent. Patentees, however, generally began with an obscure description of the machine as a whole, and then referred to the alteration or modification proposed to be introduced; they so worded this description as to cover any possible combination or arrangement in which this might be carried out. They then waited to see what other people were doing. After a time they attacked some man for infringement, and endeavoured to show that what he was doing was covered by the words of the specification; an action was then brought, able counsel engaged to describe the combination, beautiful models were prepared to exhibit these combinations, an array of witnesses were called to say that such a combination was found in the specification. Such a state of things was most injurious and dishonest, and this could be remedied by compelling every patentee to describe distinctly and clearly the exact nature of his invention. Again, it frequently happened that much collateral and irrelevant matter got into the case—the case went to a hearing before a jury, and the heads of the jury, and even the judge, were so full of the plaintiff's good deeds, as detailed by his counsel, and the defendant's iniquity, that it was next to impossible to divest them of that prejudice. The case went on, perhaps for weeks, and in the end the jury found for the plaintiff. The defendant, no doubt, could and did apply for a new trial, which might or might not be granted, and if it was a case of great importance an appeal might be made to the House of Lords, and after two or three years litigation it might be, and frequently was, discovered that the thing which had been the subject of the contest was not in the specification at all, and had not been claimed as the subject of the patent. In the end it was found that the patent was bad, and the defendant gained the day, but at a heavy expense, a portion only of which he could recover from the plaintiff, and this only if the latter was capable of paying it. Such, he believed, was not an over-coloured history of a great many patents. What was the remedy for this? It seemed to him that it should be the duty of the judge, in the first instance, to see what was in the specification, and what the patentee claimed for his invention. If the patentee had not stated this so distinctly that people could understand what the invention clearly was, and how it was to be affected, the plaintiff should be nonsuited, and the defendant should not be called upon to defend himself. He would give a case in illustration of this. It was well known that litigation had been going on for a long time relative to the patent rights of a certain sewing machine. A gentleman, of whom he desired to speak with all respect, had purchased the patent rights in a certain sewing machine in America for £50, and this of course he had a right to do, and, if the patent were good, to have the benefit of it. An action was brought against his (Mr. Wilson's) client for infringement, and the plaintiff was nonsuited. He then brought an action against the same party before another judge, and at the end of six days the special jury, not being able to agree upon a verdict, were discharged. The same plaintiff then brought another action, which lasted three or four days; and at the end of that time the defendant, though advised that the patent was bad, was induced to submit to a verdict on certain terms. The plaintiff having so far succeeded, then attacked every one who he considered was infringing his patent, and filed a separate bill in Chancery against them, somewhere about 130 separate Chancery suits. An application was made to one of the Vice-Chancellors to consolidate this litigation, and to decide the case in one trial; but this was refused, and if it had not been for the Lord Chancellor, who would not allow such a scandal to be perpetrated, there would probably at this time have been 130 suits in Chancery going on on this matter. The Lord Chancellor, however, insisted upon having the whole thing tried in one suit before him, and at once called attention to the specification, sitting day after day in order to give the plaintiff's counsel full opportunity of showing that what was relied upon was covered by the specification. It turned out, however, that the invention claimed was nowhere to be found in the specification at all, and the Chancellor upset the patent. These facts went to show the necessity for explicit description. There was, however, another matter to which he desired to draw attention. When the defendant in a patent case put in his pleas he was bound to deliver a statement of his objections to the validity of the patent. Those objections generally consisted in the recital of a mass of specifications of a number of other patents alleged to have anticipated the invention in question, and counsel had to sift from this mass of matter what was really of value to the case, whereas the defendant should be required to point out and define what particular parts of these specifications he relied on for his objections. There was another point to which he would refer, and this affected the principles on which a patent was granted. At present a patent was granted for any new manufacture. If a man took out a patent for a machine that would not work, or for a candle that would not burn, the patent was void, because they were not manufactures at all; but suppose a man took out a patent for a machine which would work, or for a candle which would produce light, he apprehended the patent was in itself good, though the machine might be less effective, or the candle less brilliant, but at the same time more costly, than those formerly in use. In other words, the patent law required absolute and not relative usefulness. He could not conceive on what principle a man should have the right of shutting out other people for three, seven, or fourteen years, unless the invention conferred some benefit upon the nation by publishing it. Therefore, he contended, a change was required in the principle of the patent laws from novelty to actual merit. He thought it would be found it was not impossible to work this out. Suppose they had first of all the application for the patent as it was at present: the patent would date from that time. Then suppose the specification was filed: then the third stage would be the sealing of the patent. At this stage the specification would have been printed in detail, and the patentee should then make a formal application for the sealing of the patent, and this might come on to be heard in public before the new Patent Court, or some such tribunal, and the patent could be sealed or not after hearing all that could be urged in favour or against it, and thus an immense amount of rubbish would be got rid of, and people would be more careful in applying for useless and obstructive patents. This plan would effect what had been suggested in the paper, viz., a preliminary investigation, the only difference being it would be done publicly instead of

privately, avoiding proceedings liable to much abuse. At the same time he would reserve the right of appeal to a higher court, although under such circumstances he thought the appeals would not be very frequent. Such a proceeding would be very analogous to the applications made to the Privy Council for a prolongation of the term of a patent. It had been objected to this course that a poor inventor would thus be led into litigation before he could have made anything by his patent. The answer to that was that there was no reason why it should cost the patentee anything. He might go before the lower tribunal, or even the Privy Council, and describe his patent himself, then there would be no cost. Then it might be said that a proceeding of that kind would shut out many good patents and let in many bad ones. It might be said such inventions as gas and the screw propeller would never have passed through such a preliminary investigation. The answer to that was, that when an invention was laid before a body of scientific and competent men it was not likely to be pooh-poohed, if it was a valuable invention. Besides that, the necessity for merit would be less in the case of an invention of that kind than in the case of an invention which dealt with an existing manufacture. If a man now applied for a patent affecting an existing trade, it should be shown that the invention was a good one; but if it did not interfere with others, as in the case of the screw propeller, it might pass with much less belief in its merits on the part of the court of investigation than in the other case, or the hearing might even be postponed, and the patentee might come again. He thought it was impossible to defend the patent laws as they existed, and the system was getting worse. They must either improve this system, which he thought might be done, or make up their minds to give up the patent laws altogether.

Dr. Collyer thought the subject of patents admitted of easy and simple elucidation. Men who had money did not, as a rule, devote themselves to invention. To be an inventor necessitated a prior education and intelligence. There were exceptional cases; but almost all the great inventions had been accomplished and perfected stage by stage, and year by year; and those who were most conversant with inventions and inventors, knew very well that invention begat invention, and in the majority of cases it required a large expenditure of money to put them into practical execution. Defects had to be remedied, and it was only after many years that an invention was perfected. At the same time there had been valuable inventions, no doubt, which had not gone through those stages. The steam engine of Watt had to pass through all these stages, and even now improvements in the steam engine were daily going on; and were it not for the protection which the patent laws afforded, very few men would devote their time and intelligence to invention. Many men were called inventors who had no right to that title. A host of patents existed which were the cause of the objections raised so constantly against the patent laws. This would be met, as suggested in Mr. Webster's paper, by a preliminary examination. That plan had been very successfully carried out in America. With regard to the value of an invention to the authors, that could not be anticipated. The value of it could only be determined by the working, after a sufficient time had elapsed. He had himself taken out no fewer that fifteen patents on one subject, and he believed he had now arrived at something like perfection. He would like to see the patent laws revised. They all felt the difficulties that had been pointed out by Mr. Webster, but he would say, as an inventor, he hoped that these difficulties would not deter them from endeavouring to amend the system, and retain the patent laws, to abolish which would be to rob a man of the fruits of his intelligence, honest perseverance, and industry, and be a disgrace to the advancement of civilisation.

Dr. Bachhoffner, as the proprietor of several patents, had no hesitation in stating that the present law was a delusion and a snare. But, though much might be said against the system itself, much more might be said against inventors. The gentleman who first addressed them had given a graphic description of the intricacies of the law. One of the most ticklish things of all was the provisional specification, and next the final specification. He would appeal to Dr. Collyer whether the object of the inventor was not to disguise as much as possible what was intended to be done, and to tell the public as little as possible for fear of infringement. A man might invent, or fancy he had invented, something that had not been invented before, and the difficulty was to know whether any one had invented such a thing previously. A cautious patent agent would advise him in his specification not to claim anything specific, but to leave it open to his opponents, if he had any, to find out what he did claim. That was the state of patent specifications generally in this country. He fully concurred in the view taken by Mr. Webster as a fair and proper one, but there were great difficulties connected with it. It had been suggested that there should be a judicial council to investigate the claims to patents; but in the case of a chemical patent, how could a fair decision be arrived at when the process dealt with was an entirely new treatment or combination of chemical elements? If the patent were granted, it must be on the *ipse dixit* of the applicant, and rights would thus be created with possible injustice to others, because a patent when thus granted, to be of any value at all, must be one that could not be overturned. As the law of patents now stood, when an inventor had paid the money for the patent, all he got was the privilege to go to law to defend it. The subject was one which it well became this Society to grapple with—how he scarcely felt competent to suggest—but it was important that something should be done to wipe away this great disgrace from the laws of the country.

Mr. Paul remarked that before they could consider how invention was to be encouraged and inventors rewarded, it was necessary to define what was an invention. No doubt many of the patents granted were not valid, and the majority of them were neither novel nor useful. Mr. Webster in his paper had pointed out what he considered a distinction between discovery and invention. He must say he could not altogether realise the distinction which had been thus drawn, and he regarded many patented inventions as essentially discoveries. It was difficult to assign to each particular individual the degree of credit that belonged to him, and that remark applied to almost all the subjects for which patents could be obtained. As the knowledge of scientific principles became enlarged the area of novel invention became more and more narrowed. That was particularly the case in the matter of chemical patents. It was almost impossible to say with regard to chemical patents where the novelty of the invention was, what particular portion of it that was essential to the process was new, and what portion though essential was old. It occurred to him that it might be of great advantage if the character of novelty in these matters were somewhat less strictly insisted upon or limited, so as to admit of retrospective application. In the distinctions drawn by Mr. Webster between discovery and invention, vaccination had been adduced as an illustration of the argument. The novelty as well as the utility of that practice had been established, but yet vaccination was stated to be incapable of reward as an invention; at the same time patents were granted for medicines that were to cure all imaginable diseases. There appeared to him an inconsistency in this. With regard to the reward to inventors and the property in inventions, the inventor was not always the person rewarded by the operation of the Patent Law.

Lord Alfred Churchill, M.P., said that the patent law of this country was in a most unsatisfactory condition, and that amendments in it should be made was almost universally admitted. The great difficulty was to discover

the direction in which the amendment should take place. They could not disguise the fact that in the opinion of many persons it would be best that the patent law should cease altogether, but he for one could not admit that, until some other means were adopted for giving a fair reward to inventors for what they produced. The proposition he thought deserving most attention was the third which had been submitted by Mr. Webster in his paper, viz., that the owners of a patent should be compelled to grant licenses, or to sell the whole right, for the benefit of the public, on adequate consideration. Now the very same idea occurred to him, and he had embodied that principle in a skeleton bill, which he had submitted to the consideration of his friends. The object of that bill was that a patentee should not possess an exclusive or obstructive monopoly in the use or manufacture of his invention, but that he should have full claim to a royalty from other persons for making use of his invention. He proposed in this skeleton bill, first, that no monopoly clause should be introduced; secondly, that parties obtaining patents should declare what royalty they considered would be a fair remuneration to them; thirdly, that the amount so declared should be advertised in the most public manner; and fourthly, that at the end of six months or any other fixed period the public generally or any manufacturer should have power to object to that royalty, and that then the amount should be decided by arbitration. He thought if these points were well considered they would find that inventors would obtain ample remuneration. He could imagine no greater misfortune to a man without means than to be an inventor. He knew of thousands of cases in which men had been ruined by their own brains. If they could have the means of placing their inventions before the public in some such way as he had pointed out, with the certainty that they would obtain a royalty proportionate to the value of the invention, they would not be induced to follow the course mentioned by Dr. Bachhoffner of drawing out their specification in such a way that nobody could know the meaning of it. On the contrary, they would be anxious to state the nature of the invention as clearly and fully as possible, in order to obtain the royalty which attached to it. He was glad to find that this idea had been entertained by Mr. Webster, and he had no doubt that gentleman, with his large knowledge of the subject, would be able to apply it in a practical and useful manner.

Mr. Peter Graham said he would offer one or two observations on the general policy of granting patents. The broad principle to be considered was this, viz.—whether the granting of patents conduced to the progress and improvement—and thereby to the benefit—of the public? It had been lost sight of so far, that something more than mere invention was required—it had to be brought into practical use. An invention was often attended with many trials and difficulties, and in some cases thousands of pounds were expended before any practical results were arrived at. Men would not be foolish enough to waste time and risk capital unless there were some chance of ultimate advantage from it. Hence, he contended that the principle of the patent law was just, and tended to progressive improvement and public benefit. With regard to the application for extension of the term of patents, he thought this was necessary; when a man brought forward a new invention, affecting an established manufacture or trade, he had all prejudices to contend with before he could bring it into use, and unless he was in a position to carry it out himself, he must find persons willing to bring it forward, and great sacrifices were frequently necessary for this end. He recollected when the power-loom was first adapted to the manufacture of Brussels carpets. The inventor in the first instance took it to Kidderminster, the great seat of that manufacture. The answer given by the manufacturers was, first, that they did not believe that it was practicable, and secondly, if practicable, that they did not desire any change or improvement in the carpet manufacture. In another instance, in which an ingenious man invented a new thing in connection with the same branch of manufacture, it was agreed to put the thing to work, but the parties afterwards paid the forfeit of £200 and gave it up. However, the invention was subsequently applied by the inventor himself, and it had been the foundation of one of the most colossal manufactures in this country. Would any one tell him that the inventor would have spent his time and money in that way if his invention had not been protected by a patent, and if he had not had anticipations of reaping the reward of his invention? With regard to the means of obtaining patents, he thought at present they were obtained with too great facility. The suggestion of Mr. Webster, with reference to that point, was a good one; but with regard to Mr. Wilson's proposition, he did not think it practicable, for a poor man would not have the time and money to do it, and, as had been remarked by a previous speaker, rich men were not generally inventors. They found capital to perfect the inventions of others, but they were not the real inventors. They had large manufactories or warehouses, and they were, in many cases, content to continue as they were, and did not encourage inventors to come amongst them. No doubt thousands of patents were perfectly useless, and in like manner there were a great many laws on the statute books which might be abrogated with benefit to the community. He thought the suggestions of Mr. Webster for the improvement of the patent laws were valuable. He thought the public, and particularly the Society, were indebted to that gentleman for the manner in which he had brought this subject forward. He agreed with every principle laid down, and with every opinion expressed in the paper, having for the last twenty years had much to do with many patents.

Mr. Wm. Hawes said at present the discussion had gone entirely in one direction. Nearly every gentleman had, to a certain extent and in various degrees, supported the present system of patent laws, or rather the principles on which they were based. He would in the first place reply to the observations in the very able and modest paper of Mr. Webster, because that gentleman, while criticising severely the arguments contained in a paper which he (Mr. Hawes) read before the last Social Science Congress at Glasgow, he had done it so in so agreeable a manner as to make it a pleasure rather to hear himself criticised than to raise a word of complaint as to the manner in which the freedom of criticism was exercised. They must allow him to say that he thought the paper they had just heard grappled with only a small portion of the subject. Mr. Webster treated the patent law as an inventors' law only. He did not touch the patent law as a public law, affecting public and national interests, but he had laid down the propositions that invention was entitled to protection, and that there was a property in inventions; and having stated these two propositions he went on to defend them, and to show how that property should be protected and how that principle was to be supported. He (Mr. Hawes) would not gainsay that there was a property in invention, but he would say the patent law by which they attempted to maintain that property was injurious to the nation, was not on the whole beneficial to the inventor, and led a larger number into difficulty and ruin than to fortune and success. Mr. Webster had drawn a very interesting distinction between invention and discovery. It was a distinction which might be drawn in a paper of this kind, read before an intelligent body of men, but it did not apply to the great practice of the world. It was impossible by law to define the difference between invention and discovery, and so long as there was that undefinable difference there would always be great difficulty in practically separating them, and in maintaining that some of the greatest discoveries were not inventions; for what discovery did more good, or had saved more lives, than the discovery of chloroform? and yet the men who discovered that agent, by the rule now laid down had no right to reward or to have their

services acknowledged by the nation. He said it was taking a wrong view to endeavour to establish such a distinction. They could not maintain it in practice, and it would confuse instead of elucidate the question. It was a distinction without a practical difference, which he could not admit as applicable in this case. Reference had also been made to the protection afforded by copyright. He was told that the copyright protected one man only and one work only, whereas the patent right went beyond that, for it not only protected the inventor but protected his machinery and property, and prohibited others from using that machinery and property without his leave and license. But a book, a picture, or any artistic work was only so far protected by copyright as to secure the individual producing it against the exact reproduction of that which he had produced, and the world was allowed to benefit by that work, and to use it as they pleased, improving upon it, using the same materials or arguments, so long as they did not copy or sell that which was an exact copy of another man's mind. There was protection to intellect, and property in it, and when they went beyond that, and prevented men applying any portion of a previous invention without the leave and license of the patentee, they did an injury to society, they obstructed progress, they increased the cost of production to the public, and delayed rather than increased the progress of invention. These distinctions were worth bringing forward by the author; they were interesting, and deserved consideration; but they did not meet or grapple with the real question—What was a patent? what was it granted for? for whose benefit was it granted? and did it do good or harm materially? A patent right was a monopoly; it was a remnant of the laws of olden times. It gave a man a right for years, to the exclusion of all others. It prevented other men from using, by directly improving upon it, that which another had invented. It was originally intended, no doubt, for the benefit of the individual, and not for the benefit of the country, for the registration of specifications was originally intended to prevent the loss of inventions, or the means whereby new things were produced. He disputed the principle on which patents were founded. He repeated that it was for the benefit of the individual that certain restrictions were enforced, and not for that of the country. For instance, the registration of the specification was considered to be for the benefit of the patentee as well as of the public, and as the best means of perpetuating the discovery. The principle on which that registration was founded was not applicable to the present time. Every patent law was a prohibition to the world. When a specification was taken out, it was not, he apprehended, with a view of concealing the object, but rather of announcing the discovery to the world. It was a publication of what had been done, but which the inventor's own countrymen could not use without his license, though the rest of the world might use it without any charge whatever. His friend next him (Mr. Graham) reminded him that the patent might be taken out abroad. They might take it out in many countries, but what check was there against the use of it compared with that in our own? Some few patents were secured abroad, but with the great mass very little good was done to those who invested their money in foreign patents. The evil of the publication of specifications in the present time was that it was the means of assisting our rivals abroad gratuitously to that for which we obliged our own countrymen to pay a royalty, so that while we sent them our inventions broadcast over the world to be used in other countries by our rivals, without payment, we taxed our own industry. Was that just to ourselves, and was it the means by which the patent law upheld the great manufactures of this country, and rewarded inventors? He said not only was the patent law injurious, but it was also detrimental to the progress of our own manufacturers, because it held out a premium to the manufacturers abroad to reproduce our best productions. Look at it in another point of view. What was the number of patents taken out annually in this country? There were about 3,000 new inventions patented per annum; this had gone on year by year since 1852, so that between 25,000 and 30,000 patents had been granted during the last ten years. Where, then, was the progress of discovery by which they could mark the beneficial effect of these 25,000 or 30,000 patents? What was the cost of them? A million of money had been paid in official fees. How much more would have been paid in law to protect them, if each had had to be defended in 150 Chancery suits, might be more easily imagined than correctly stated. There could be no doubt litigation was a matter which added considerably to the charges for those patents. Then how did they test the results obtained from these 30,000 patents during the last ten years? If they looked to the Jurors' Reports of the Exhibition of 1862—not the opinion of one or two of them merely—but of nearly all, they would see the opinion expressed that the results of new invention in the previous ten years were not such as might have been anticipated, notwithstanding the large number of new patents taken out. That was the result of a million of money spent on patents; that was the result of investments, many times greater, in the experiments, labour, and machinery required to justify taking out a patent, and in law expences to defend them. Then, to go a little further, let them look at the amount of property in these patents. He had said on an average there were 3,000 patents taken out annually. There were 3,200 patents taken out in 1862. Of these 3,200, 1,200 died a natural death before having arrived at the great seal, £5 in fees, besides other expences being paid on each. That was the first instalment under this law—1,200 out of the 3,200 were not considered worth the £20 to secure the first step. The expenditure on these 1,200 was all lost. That left them 2,000 yet to be dealt with. Of that number only about 550 paid the £25 necessary to get an extension for three years; therefore there were about 1,500 of the 2,000, every one of which was impeding progress, and was a fetter upon some other genuine inventor; 1,500 sank and died rather than pay the £25 to continue the protection for three years. Then what became of the other 550? £50 must be paid at the end of the third year to continue the protection for seven years, and only 100 got to that stage, so that out of the whole 3,200 patents the full fees were only paid upon 100 for the extension of the exclusive right for another seven years. If they wanted stronger facts than these to prove the absurdity of the Patent Law they had only to look at the records of the Patent Office to satisfy themselves that whatever of good there might be in the principle of patents, it was not to be found in the patent law as it existed in this country, but having these facts what could be said in support of protection to property in patents, if only 100 out of 3,200 were worth £100 at the end of two years. We might be told that the argument he had used, that they were beneficial to foreigners while useless to ourselves, was of little value, because inventors might take out patents for foreign countries. That appeared at first sight an answer to the argument, and he was asked by Mr. Webster to show them an instance in which an invention of this country had been used to our disadvantage abroad. How could his friend expect him to show an instance of that kind? All he could say was if the patents were so useless to foreigners that they rarely or never used them, when they had no fees or law expenses to pay, when they could get them without labour, without anxiety, without taxation — if they were useless to them what use could they be to this country? If these patents were of so little value that they might be thrown broadcast among our great manufacturing rivals all over the world, could they believe the maintenance of the law under which they existed, and which involved taxation of the public to a great extent, and which pretended to foster invention and reward the inventor—could they believe it was of much

service to this country? Let them look at the reward it gave to inventors—how was it tested, where to be found? Every speaker had referred to the losses which inventors encountered. It was notorious that the great bulk of inventions had not rewarded the men who had produced them. Undoubtedly men had been rewarded who improved upon the inventions of others. The men who invented the beautiful dyes from a waste and almost noxious product — the two distinguished men who discovered the existence of those dyes, never received a penny for their services; while a comparatively obscure chemist — a man having no right whatever to claim reward for the invention—took out a patent founded upon the skill and research of Faraday and Hofmann, and that man and others were making large fortunes from the results of the labours of those two great philosophers. He said, as against the country, that right ought not to have been granted. Then Smith, the inventor of the screw propeller, was not adequately rewarded; others had benefited largely by additions made to that great discovery, but the man who devoted his life to the subject got nothing for his patent. There were plenty of patents, extending over a long range of inventions, which had not been profitable to the patentees, which had, on the contrary, ruined the inventors, whilst the rewards had been reaped by a class of men who did not deserve the name of inventors, who would succeed whether they had patent laws or not; but who, out of a bad protective system, had derived large fortunes, and, therefore, were the supporters of these laws. The same language might be used with regard to the great originator of the Penny Postage; and the corn laws were at one time regarded as necessary for the protection of the interests of the British farmer; but he would say the abrogation of the patent laws, instead of defeating invention, would be a great stimulus to it, and they would never, under the present law, do so much for this country or for individuals as they would by allowing every man to win the laurels earned by his own brain, and allowing the country to reward him for his labours. They did not find that the philosophers, the physicians, the surgeons, or the great artists and authors of this country, were deterred in their career of usefulness or of invention by want of patents; yet they were not wanting in discovery, which they applied to the benefit of mankind at large. No country possessed greater philosophers, greater physicians, greater surgeons, or greater artists than this, from Sir Humphrey Davy down to Faraday and Hofmann, and yet all had worked on without the stimulus of the patent law. This was his view of the patent law; but while he was entirely opposed to the present law, he did not say there should not be some system by which real inventions, such as those of Rowland Hill, Smith, Hofmann, and James Watt, should meet with some reward. He believed there were means to be discovered by which great inventors and great inventions—he did not mean mere additions and changes bit by bit, which he did not call inventions—might meet with a suitable reward. Means might be found by which great inventors—men whose genius led them *con amore* to pursue researches for the benefit of mankind—might be honoured as well as rewarded, and to that extent he desired to reward invention and the individual talent which had led to invention. He would in a few words just call attention to the extraordinary arguments that were used in support of the views that were brought forward by various speakers. They were told that the best mode of remedying these abuses was to have a committee of experts, to whom all inventions were to be submitted, by whom it should be determined whether a patent should be granted or not. Would a man who knew anything about inventions submit to have his plans tested by those who were in arrear of him? because the essence of invention—the position a man placed himself in as an inventor, implied that he had more knowledge than his neighbours, and was in advance of the experts to whom it was proposed to submit his invention; and, taking mankind as it was, a man who was an inventor, and was in possession of a new principle, would be unwilling to submit it first to such a body of men and then be found to give up his idea because those men said it was not new, or it was not likely to be a profitable patent. An inventor must be a man in advance of his age, and yet he was to be asked to submit his plans to those who were behind him, and who, perhaps, could not thoroughly estimate the value of the new principle brought before them. Let them imagine Mr. Winsor, the inventor of gas-lighting, submitting his plans to those who would have been the experts upon public lighting in that day—the great oil merchants—and asking them to decide whether gas was capable of giving as much light as the old oil lamps. Did they think they would ever have had gas? In 1814 the idea was ridiculed of passing gas along the streets in pipes like water. Then again, the idea of submitting to such a body the question whether a wheel should have 20 instead of 30 cogs, or a particular fix of gearing — it was nonsense to call that invention—or whether a lever should be 10 inches long instead of 16? or whether a sewing machine should have one shape of needle instead of another, or this or that kind of stitch?—to call those inventions was an absurdity and an abuse of terms. Patent right, if he understood it rightly, was to protect that which was entirely new and useful—not to protect those things which were a necessary consequence of the application of a man's ingenuity with hundreds working at the same thing day by day. There was one remark of his friend (Mr. Graham) he must notice, that was with respect to the reluctance of great manufacturers to encourage new inventions in their own branch of trade, and he illustrated his view by one case in which the inventor brought his own designs into operation and made a large fortune thereby. His friend also said that very rich men never troubled themselves about new inventions, but he would say if there was one man in the metropolis more ready than another to advance capital in the promotion of a really good invention, that man was his friend Mr. Graham, and he thought that was the best answer to his friend's argument. The inventor must have a capitalist with him, because it was said not to be in the nature of things for an inventor to be rich. Many great inventors were comparatively poor men. Roberts, the inventor of the self-acting mule was a poor man; and probably a few days hence this room would be appropriated to a meeting for the purpose of providing a subscription for his daughter, who was left in bad circumstances. His principle was if there were inventors—if they acknowledged them as such, they ought to find some means by which their talents should be acknowledged by a grateful country; but he did not apply that observation to a host of men who had no right to the protection which they sought, and he denounced the present system as untenable upon any sound principle.

Mr. Newton Wilson expressed a hope that as there were many gentlemen present who were desirous of speaking on this subject, the Council would consent to the discussion being resumed on a future evening, and he therefore moved that the discussion be adjourned.

Mr. Spencer thought there was a great mistake in the nature of this discussion. They were going into details, and no one looked at the great principle at stake. Sir William Armstrong, the *Times* newspaper, and all who advocated the abolition of the patent laws, went into matters of detail, which, when investigated, came to this, that the patent laws were not carried out as they ought to be; that patents which ought to cost only £5 cost £100; and that the large sums annually expended on that account were owing to so called inventors being allowed to protect their inventions. He thought that was wholly beside the question. He thought, with all deference to Mr. Hawes, that he entirely misapprehended the question. He did not think they could judge from facts, for facts had been

wrongly applied, because wrongly brought about. If they had an institution so badly conducted as to check invention rather than encourage it, and from thence it was argued that the patent law was wrong, he thought that was no argument whatever. He (Mr. Spencer) considered there was a right in the individual as well as in the public? There was an undoubted property in invention. Mr. Hawes said he appreciated the inventor, but could not appreciate the man who went on step after step in the improvement of an invention. He would refer that gentleman to his own case of James Watt, and he asked where would have been the splendid results now realised in our great commercial steam marine if there had been no improvements made upon Watt's discovery and invention? Where they to keep the ashes of the dead for hundreds of years and say that no benefit should accrue to the man who brought the results of improvements before the public? What was the test of the value of an invention? It was the benefit the public got from it. If they could now get the same amount of horse-power from an engine with 3 lbs. of coal that Watt got with 8 lbs., he thought that was a *bonâ fide* advance, the merit of which was due to later invention. But that was attained step by step, and yet this was what Mr. Hawes had depreciated. He thought in the matter of property in an invention there could be no misunderstanding. A man having a small cottage was as much protected in his rights as the man of large estates. He said if a copyright was allowed, and if a man was allowed to print his thoughts, and give them to the public as his own, the man who invented ought to be allowed to do the same; and of the degree of merit in invention he did not think they were fair judges. If such a Board as Mr. Webster had suggested had existed, nineteen-twentieths of the present patents would not have come into existence. He was not arguing so much upon the present state of the patent laws as the state they might be in if the suggestions of Mr. Webster and others were carried out. That was the question now before them. It was the question whether individual right was to be respected—whether a man had a right to hold his own invention as a property. If not, what was the use of discussing the matter? He held that on every ground there was a right. The man who invented had a property-right in the thoughts he had worked out into a practical form, and unless that right were accorded, invention would go down. They were arguing as if capitalists were the most liberal and appreciative class of men—as if their language was, "Come to me with your invention, and I will pay you handsomely for it;" whereas he believed the rule was (though there were noble exceptions), "I will get as much as I can for myself, and will pay as little as possible for it." So far, therefore, from holding the views of Mr. Hawes, that invention would go on better, he believed it would not go on at all. He spoke as a patentee himself —one of the step-by-step men. He had spent his life in doing certain things, and he believed he had done good in a small way; and if inventors did not look for money reward, they looked for large results in another way. But it was the case with some men that the genius of invention was within them and it must come out, and when it came out they were justified in keeping it to themselves up to a certain point. If they admitted that a man's thoughts were beneficial to the public, he had a right to the same protection, that he might receive the value of them in return, as he would receive in the case of his cottage or his houses and lands.

The Chairman announced that the discussion was adjourned to the next meeting.

Proceedings of Institutions.

Banbury Mechanics' Institute.—The report of the secretary, adopted at the half-yearly meeting on Tuesday, 22nd March, states that the Institute has never been in a more flourishing condition, whether reference is made to the attendance in the news-room, the circulation of the books, or the subscriptions of the members; the number of the latter being greater than on any previous period. The prizes offered by the committee for the 1st and 2nd best essay on physical education, and the first crusade, called forth nine competitors, four for physical education, and five for the first crusade. The adjudicators deemed it advisable to withhold the first prize in one case and the second in the other, awarding only a first prize for the first crusade, and a second for physical education. Mr. Whitehorn was the writer of the successful essay on the first crusade, and Mr. A. Buller of the one on physical education. The committee regret the continued want of interest manifested by the members in entertainments. The public readings have not this winter been given so frequently as in former seasons, in consequence of other societies catering for the public in a similar manner; but they have been a decided success whenever given. Throughout the past winter a chess club, in connexion with the Institute, has held bi-weekly meetings.

Llanelly Mechanics' Institution.—A fine collection of geological and mineralogical specimens has been presented to this Institution by Earl Cawdor, and they are now being classified and arranged by Mr. F. Bodkin. Mr. Bodkin recently delivered two lectures on geology and mineralogy, having reference more particularly to the collection at the Athenæum, specimens from which were handed round to the audience. The chair on both occasions was occupied by the President of the Institution, W. H. Nevill, Esq. At the close of the second lecture a vote of thanks to Mr. Bodkin was moved by Mr. Buckley, and seconded by Mr. R. T. Howell, and in putting it to the meeting the chairman expressed how much pleasure he had derived from Mr. Bodkin's lecture, and referred to the great difficulty of arranging the large collection of specimens so liberally presented by Earl Cawdor. These specimens were all valuable, and had been arranged by Mr. Bodkin, and he most cordially agreed in the sentiments of the mover and seconder that the thanks of the meeting were due to Mr. Bodkin. The motion was then put, and carried with applause.

Fine Arts.

New Fresco.—Mr. E. M. Ward, R.A., has recently completed another picture for the decoration of the walls of the palace at Westminster, one of the series of fresco paintings for the execution of which he holds the royal commission—the landing of Charles II. at Dover on his restoration to the English throne. This picture has been painted in the new water-glass medium.

Manufactures.

Chatham Dockyard Machinery.—The Lords of the Admiralty have sanctioned an expenditure of between £16,000 and £17,000 for new machinery at Chatham Dockyard, the whole of which is to be forthwith erected. The new machinery ordered includes a hydraulic press of a new description and of a size larger than any now in use at either of the Royal dockyards, for bending the 6-in. and other iron plates intended for the *Bellerophon* and *Lord Warden* iron-cased frigates. Four thousand pounds is also to be expended in the erection of six additional overhead travellers beneath those sheds where the iron vessels are to be built, to be used in armour-plating the ships. They have also decided on laying out £10,000 in the erection of new and improved spinning and other machines in the rope-making establishments at Chatham Dockyard, where the largest cables are now manufactured by steam.

Preventing Incrustation in Steam Boilers.—Mr. W. C. Page has put forward an invention which is to

prevent the sedimentary deposits in steam-boilers from forming a hard crust at the bottom and sides, and also to remove such incrustations when formed. To this end he employs a solution prepared by heating together, in an iron pot, creasote, or any vegetable, animal, or mineral oil, with chloride of ammonium, carbonate of soda, caustic soda, or potash, or any soluble chloride of carbonate, in the proportion of about 16 ounces of creasote to one ounce of the other alkalies mentioned. The solution thus prepared is introduced into the boiler through the feed-pipe or otherwise; about one pint to each horse-power being sufficient for about eight weeks; at the end of this time the boiler is blown off from the bottom, and fresh solution added. After continuous working for some months, the only operation necessary is to blow off the boiler and remove the sediment by hand. When the incrustation has already formed, the solution is introduced into the boiler; it is then put into use for two or three weeks, and the deposit, which was hard before, can now easily be removed by hand. The composition may be made either liquid or solid.

Clarifying Wines.—The number of eggs employed for this purpose in Paris alone is stated to be about four millions and a half. By this means a wholesome and nourishing article of food is taken away from public consumption, and its price considerably increased. To avoid this, certain kinds of powders are now beginning to be employed, by which wines may be clarified with equal facility and at a smaller expense.

Agricultural Show in France. — The agricultural Show of the Loire district is to be held in the first fortnight of May, and the landed proprietors of that and the adjoining departments have taken the opportunity of inviting all makers of steam ploughs to compete for prizes in money and medals offered to the successful competitors by them and the Minister of Agriculture. The ploughs are required for deep ploughing, ordinary ploughing, cultivators, grubbers, &c. The prizes are three in number; the 1st prize is £100 and a gold medal; the 2nd, £80 and a silver medal; and the 3rd is £40 and a bronze medal. Besides these there is a fund of £160, to be divided equally between foreign exhibitors, towards payment of their expenses, and the French railways will carry their implements at half-price. The ploughs are required to be on the ground by the 27th of April, and the trial will take place from the 28th of April to the 7th of May inclusive. The place of trial is Roanne, in the department of the Loire, about twelve hours' journey from Paris by the Lyons railway. A jury will decide on the merits of the competing ploughs. This jury is composed partly of French and partly of English members, the English being Messrs. Wilson, Fisher Hobbs, and T. J. Thackeray. The object of the competition is to introduce steam ploughs into the department of the Loire and the adjacent departments, the ordinary ploughs having been inefficient for the stubborn soil of the country.

Commerce.

Cotton from China.—The following is the export of cotton from the China seaboard from January 1st to February 11th. For Liverpool from Hong Kong, the *Kohinoor*, with 7,958 bales; the *Dolfijee*, with 2,676 bales; the *Cornelia Hendrika*, with 3,456 bales; the *Devonshire*, with 9,368 bales; the *Bella*, with 4,274 bales; and the *Norwood*, with 4,000 bales. For Liverpool from Shanghai there had sailed the *Spirit of the Times*, with 5,840 bales; the *Veloz*, with 4,672 bales; the *Ralston*, with 3,841 bales; the *Alice Painter*, with 4,343 bales; the *Queensberry*, with 4,368 bales; the *Thomas Royden*, with 5,892 bales; the *Isabella Hercus*, with 3,840 bales; and the *Constantia*, with 3,642 bales. For London from Shanghai we have the *Strathallan*, with 4,123 bales; the *Lansdowne*, with 4,577 bales; the *Oliver Cromwell*, with 3,300 bales; the *Oithona*, with 5,479 bales; the *Wagoola*, with 4,232 bales; the *T. Dryden*, with 3,185 bales; the *Annie Archbell*, with 4,500 bales; the *Alchymist*, with 4,662 bales. From Yokohama the *Vampire*, with 300 bales, had sailed, and from Kanagawa, the *Forerunner*, with 4,728 bales, and the *Alexandra*, with 4,538 bales.

Coal in the Punjaub.—A vein of coal or lignite, said to be inexhaustible, has been opened in the Punjaub. It has been tried by the Punjaub Railway Company for its locomotives, the chief engineer pronouncing favourably on it. The discovery has caused considerable interest in the Punjaub; for if it prove to be, as it is described, of a quality equal if not superior to that found in Bengal, it will secure the profitable working of an extension of the railway. The discovery of this vein has been made about 150 miles northward from Lahore, on the banks of the Jhelum, a little to the west of the ordinary road to Peshawur.

Wine Statistics.—The quantity of wine imported into the United Kingdom in the year 1863 was 14,186,189 gallons, whereof $5\frac{3}{4}$ millions were red, and nearly $8\frac{1}{2}$ millions white. Compared with the supplies in 1862 the above total is $2\frac{1}{4}$ million gallons in excess, of which Spain contributed 1,350,913 gallons, Portugal 546,394 gallons, and Italy 165,642 gallons. The only decrease of any note is 58,026 gallons from France. In the subjoined table are given the exact quantities imported from each country in the years 1862 and 1863, showing the increases and decreases thereon respectively:—

Countries.	Years ended Dec. 31. 1862.	1863.	Increase.	Decrease.
	Gals.	Gals.	Gals.	Gals.
British Possessions—South Africa	49,455	105,165	55,710	—
Other British Possessions	7,987	7,310	—	677
From Holland	314,238	363,857	49,619	—
From France	2,244,727	2,186,701	—	58,026
From Portugal	3,048,491	3,594,885	546,394	—
From Madeira	47,102	39,460	—	7,642
From Spain	5,365,647	6,716,560	1,350,913	—
From Canaries	19,484	10,069	—	9,415
From Italy	211,489	377,131	165,642	—
From other Countries	652,056	785,051	132,995	—
Totals	11,960,676	14,186,189	2,301,273 75,760	75,760
	Increase in 1863.........		2,225,513	

The quantity entered for home consumption last year amounted in round numbers to $10\frac{1}{2}$ million gallons—an increase, in comparison with the returns in 1862, of 675,373 gallons. Of the aggregate, $4\frac{1}{2}$ million gallons were the produce of Spain, $2\frac{3}{4}$ millions of Portugal, 2 millions of France, 321,485 gallons of Holland, 276,280 of Italy, 108,951 gallons of British possessions in South Africa, and 2,849 gallons of the Canary Islands. Spain shows an increase of 576,000 gallons, Portugal of 268,243 gallons, Italy of 60,777 gallons, France of 38,355 gallons, Holland of 5,312 gallons; while South Africa and the Canaries have a diminution of 67,784 gallons, and 656 gallons respectively. The total revenue derived from wine imported in 1863 was £1,214,762, an amount beyond that in 1862 equal to £91,159. In 1863 the exports of wine slightly exceeded $2\frac{1}{4}$ million gallons, or 189,121 gallons more than those in 1862. The average prices in bond in the latter year were:—French, 4s. 8d.; Portugal, 6s. 5d.; Italian, 2s.; and Spanish, 2s. 5d. per gallon; but recently the last mentioned wine has considerably increased in value. The quantity in bond on the 31st Dec., 1863, was upwards of $12\frac{1}{2}$ million gallons, or $1\frac{1}{4}$ million gallons more than at the same date in 1862.

Colonies.

Preservation of Meat.—The *Sydney Morning Herald*, referring to the premiums offered by the Society of Arts,

says—"The Trevelyan prize of seventy pounds is offered for the discovery of a process for preserving fresh meat better than by any method hitherto employed, applicable to the preservation of meat in countries where it is now almost valueless, so as to render it an article of commerce, and available for stores on shipboard. If any one will thoroughly deserve this prize he will benefit Australia not only to the extent of £70, but to an untold amount. To find out a foreign market for our beef would be to add to our commerce prodigiously. Notwithstanding pleuro pneumonia and drought, our cattle are increasing now at a rate faster than our power of consumption. Last year at one time they fell in price so low as to be scarcely saleable. The price has improved since then, owing to various circumstances, but the multiplication of stock has always a tendency to bring the price down to a point which makes it a puzzle for the stockholder to find his profit. There is, of course, always the last resource of the boiling pot, but a far better resource would be a satisfactory invention for preserving fresh beef. Such an invention would at once establish a permanent article of export of more value than tallow, and would give still greater encouragement and greater security to pastoral pursuits."

SUGAR IN AUSTRALIA.—Referring to the premium just issued by the Society of Arts, the *Sydney Morning Herald* states—"A medal is offered for the production and manufacture of not less than one ton of cane sugar, the produce of any of the Australian colonies. That the north-eastern coast of Australia is destined hereafter to produce a large quantity of sugar, we look upon as certain. Queensland, perhaps, will be the chief seat of this industry, but sugar may be grown to a profit within New South Wales. That this industry has not already taken root is owing partly to the *vis inertiæ* which seems to oppose itself to all new enterprises out of the common track, and partly to the steady absorption of accumulated capital in pastoral extension. The wealth that grows out of squatting is naturally invested in more squatting, and there is no prospect for a long time to come of this outlet for surplus investment being closed. It might seem to be equally natural that the profits of agriculture should be invested in more agriculture, and such would have been the case if there had been any such proportionate profits to invest. In some isolated cases it has been so. But, as a general rule, agriculture in this colony has not been so prosperous as its admirers could wish, and more people have been deterred from prosecuting it than have been attracted to it. The bounty of cheap land has been lately applied to give this jaded industry a fresh fillip, but at present not with any distinguished success. Tropical agriculture, however, has always been more remunerative than cereal agriculture, and if the experiment were tried with skill and energy, backed by adequate capital, the coast lands towards the north would pay for sugar far better than our tillage has yet paid in wheat or maize. A gentleman long resident in one of our sugar-growing colonies, who has recently inspected some of the Queensland experiments in sugar growing, has expressed to us the strongest conviction that success is inevitable in this branch of industry if the operation is conducted in the right way."

GROWTH OF FLAX.—The *Hobart Town Mercury*, 22nd January, 1864, in speaking of the prize offered by the Society of Arts for the production of flax, in any of the Australian colonies, of a good marketable quality, says:—"It is, however, very doubtful if a bale of Tasmanian flax can be procured, as the whole of last year's crop is said to have gone into consumption. A fine sample of flax, the growth of Tasmania, was sent to the London Exhibition in 1861, and carried off a prize medal, of which the holder is very proud. Much of the crop from which this sample was taken was manufactured into twine and plough-lines, in Hobart-town; and many Tasmanians can boast of having driven their horses at plough in beautiful flax lines, made in colonial rope walks, out of fibre produced from seed grown by their own hands. Flax grows wild in this part of the world, and only requires knowledge and culture to make it a valuable article of export; and it is to be hoped that our farmers will be induced to give increased attention to flax-growing. Seed, however, is a great object in this case, and though a supply of the best quality was received some time since, it is doubtful if a sufficient quantity is now obtainable in the colony." The *Sydney Herald* says:—"New Zealand would seem to have the best chance of producing this commodity, as the flax grows there wild, but hitherto nothing effective has been done to make the article merchantable. Perhaps the large immigration which it is proposed to introduce in the form of military colonisation may have some influence in stimulating this branch of industry. The new settlers must turn their land to some account, and as it is very doubtful whether they will be able to grow wheat at a profit, they may advantageously turn their attention to flax. It is an undeveloped resource for New Zealand, which will be of great value the moment it can be turned to account. In the western states of North America great attention has been paid, during the last few years, to the growth and preparation of flax, and with every prospect that this remunerative branch of industry will be permanently naturalised."

ACCLIMATISATION SOCIETY.—An acclimatisation society has been formed in Otago. In Victoria and other Australian colonies such societies have for some time existed, and have proved themselves of unquestionable public utility, and in New Zealand the provinces of Nelson and Southland has each its acclimatization society. They have not as yet done much, but it may be hoped that now something like unity between the three will lead to something being done. If these bodies could achieve only the introduction of the salmon and its acclimatisation they would confer a very great boon on all the Australian colonies. The Taibu River in this province has been specially designated by a competent authority as the most naturally fitted stream for the experiment which exists in New Zealand, and there can be no doubt that the climate of the province is the nearest approach to that of England which can be found here. The provincial council has voted £500 to be applied in aid of any experiment which is proposed to be made under favourable circumstances, and this money, as the superintendent has formerly stated, will be at the disposal of the Otago Society whenever the committee may determine to set about the work.

Notes.

THE ROYAL HORTICULTURAL SOCIETY has just issued the following announcement:—On the Queen's birthday, Tuesday, 24th May, 1864, the gardens at South Kensington will be opened to the public from 12 to 6, admission, 1s. Fellows may obtain any number of tickets at 6d. each. An exhibition will be held showing the various uses of flowers for the decoration of halls, drawing rooms, balconies, churches and buildings generally, &c., also dinner and supper tables, hand bouquets, garlands, and floral devices of all kinds, for which prizes will be awarded. Provided a sufficient number of works of merit are sent in competition, one prize of £5, 3 prizes each of £3, 6 prizes each of £2, 12 prizes each of £1, and 20 prizes each of 10s., with an unlimited number of honorary certificates will be given. Lady amateur artists and Royal Academicians will be associated with the judges. Spaces for large decorations will be assigned to each exhibitor who fills up a printed application before the 15th May. The objects must remain for two days on exhibition. The swags, wreaths, devices, and garlands, may be composed of cultivated or wild flowers, sprays or leaves, or branches of any description separate or combined. The swags, or garlands, must not be less than eight feet long. Artificial flowers for bouquets, &c., may be used, and with these there is no restriction as to size,

and separate certificates given. All objects must be delivered carriage free to the gardens; those composed of artificial flowers on the 23rd, all others before 9 a.m. on the 24th. All the cascades and fountains, and Minton's majolica fountain, from the International Exhibition of 1862, will be played. Three military bands will perform during the day, and assemble to play "God save the Queen" at six p.m.—On the evening of Wednesday, 25th May, the Conservatory of the Horticultural Society will be lighted for the first time, and there will be a Conversazione exclusively for the Fellows and Debenture Holders, who will be received by the President, his Grace the Duke of Buccleuch, K.G. Hours, from 9 till 11, when a military band will perform.

Commissioners for the Exhibition of 1851.—At the last meeting of the Commissioners the Earl of Derby was elected President, in the place of the Prince Consort. This election has been delayed in order that it might be seen how far the execution of the Prince's plans at South Kensington would recover the shock of his death. The sale of 16 acres of land to the Government places the commission out of all difficulty as respects finance.

Designs for the New Museum at South Kensington.—About thirty two designs and plans have been sent in for competition, and are now exhibited in the royal gallery at the palace of Westminster. They were first opened to the public on Thursday, 21st April, the exhibition having been hitherto limited to members of Parliament. The judges are said to be five, and that Lord Elcho is the chairman, the others being three architects, Mr. Tite being one, and the fifth a painter.

Sir Humphrey Davy.—A committee has been organized at Penzance with the object of raising a monument to the memory of this celebrated chemist.

Action of Light on Honey.—Honey fresh from the comb is a clear yellow syrup, without a trace of solid sugar in it, but upon straining it gradually assumes a crystalline appearance, and ultimately becomes a solid mass of sugar. It has not been suspected that this change was due to a photographic action, but this appears to be the case. M. Scheibler has enclosed honey in stoppered flasks, some of which he has kept in perfect darkness, whilst others have been exposed to the light. The invariable result has been that the sunned portion rapidly crystallises, whilst that kept in the dark remains perfectly liquid. It is thus seen why bees are so careful to work in perfect darkness, and why they obscure the glass windows which are sometimes placed in their hives. The existence of their young depends on the liquidity of the saccharine food presented to them, and if light were allowed access to this, the syrup would gradually acquire a more or less solid consistency and would seal up the cells.

Richard Roberts.—A committee is in course of formation for raising a fund for a memorial to that gentleman, the money in the first place to be applied in making a competent provision for his only daughter, and, if any remain, a bust or monument is proposed to be erected. Mr. Bazley, M.P., has consented to be chairman of the committee, on which the Duke of Sutherland, Lord Alfred Churchill, M.P., Admiral Sir Edward Belcher, and many other gentlemen of influence, have already undertaken to serve. The first meeting of the Committee will take place at the rooms of the Society of Arts, on Wednesday evening next, at four o'clock.

Correspondence.

Royal Academy.—Sir,—It is understood that very little sculpture has been sent in this year for exhibition at the Royal Academy, Trafalgar-square. When the Royal Academic sculptors themselves are not sorry to find excuses not to contribute, there is little marvel that the outside members of the profession are equally reluctant. The rooms, indeed, applied to the exhibition of this art in this building are a national disgrace. If more worthy accommodation cannot be found for sculpture it were better that she should be an absentee altogether, and that the rooms applied hitherto to her disservice should be turned over into the charge of Mr. Farrance, over the way, or some other restaurant of that class, who would be ready, probably, to pay a handsome honorarium to the academy for the privilege of there supplying cakes, ices, &c., to the weary and thirsty lovers of pictures. The so-called cellar would be much more frequented when applied to this purpose than to its former one. It would be a boon to the lovers of pictures to give them, within the walls of the building, the opportunity of refreshment, and the change would at least be a negative honour to sculpture as sparing her her former disgraces; and, moreover, the sum paid for the above-mentioned privilege might perhaps go towards a fund for eventually building a better *salon*, and providing better accommodation for sculpture herself, —I am, &c., Epsilon.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...R. Geographical, 8½. 1. Mr. Petherick's Report on his Explorations in the Regions of the Upper Nile. 2. Mr. Kirk, "On Fossil Bones from the Banks of an Affluent of the Zambesi." 3. Sir R. I. Murchison, "On the Antiquity of the Physical Geography of Africa."
Actuaries, 7.
Philosophical Club, 6. Annual Meeting.
Medical, 8½. "Clinical Discussion."
R. United Service Inst., 8½. 1. Major Scott Phillips, "New form of Paddle Wheels working under the Counter." 2. Mr. Charles Phelps, "Mont-Storm's System of Breech-Loading.'

Tues. ...Medical and Chirurgical, 8½.
Civil Engineers, 8. 1. Discussion upon Mr. Lloyd's paper, "Description of the Santiago and Valparaiso Railway; with remarks upon Resistances from Curves on Railways, and upon Coal-burning Locomotives." 2. Mr. Jas. Cross, "On the Structure of Locomotive Engines for ascending Steep Inclines, especially when in conjunction with Sharp Curves on Railways." 3. Mr. W. Bridges Adams, "On the Impedimental Friction between Wheel Tires and Rails, with plans for improvement."
Zoological, 9.
Ethnological, 8. 1. Mr. John Campbell, "On the Celtic Languages and Races." 2. Sir John Shiel, on the same subject. 3. Mr. John Lubbock, "On the Danish Coast-finds."
Royal Inst., 3. Prof. Blackie, "On Homer."

Wed... Society of Arts, 8. Adjourned Discussion "On the Patent Laws."
London Inst., 12 noon. Annual Meeting.
Archæological Assoc., 8½. Mr. Geo. Ormerod, "On the Hut Circles on Dartmoor."

Thur. ...Society of Arts, 8. Cantor Lectures. Dr. Crace Calvert, "Chemistry applied to the Arts—Flesh."
Royal, 8½.
Antiquaries, 8.
R. Society Club, 6.
Royal Inst., 3. Prof. Blackie, "On Homer."

Fri.......Royal Inst., 8. Prof. Williamson, "On the Existence of Atoms."
R. United Service Inst., 3. Major Talbot Harvey, "The Progressive and Possible Development of Infantry Drill and Manœuvres."

Sat......Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

PARLIAMENTARY REPORTS.

Par. Numb.

57. National Debt—Accounts.
66 (1). Trade and Navigation Accounts (31st January, 1864).
66. ,, ,, (31st December 1863) Corrected Pages.
78. Lighthouses (Isle of Man)—Correspondence, &c.
106. Quit Rents (Ireland)—Return.
111. Civil Services—Supplementary Estimate, Class 7 (Scheldt Toll).
39. Bills—Naval Agency and Distribution.
40. ,, Naval Prize Acts Repeal.
North America (No. 4)—Communications respecting the Vessel "Gibraltar."
North America (No. 5)—Correspondence respecting Iron-clad Vessels.

Delivered on 10th March, 1864.

19. Railway and Canal, &c. Bills (218. Belfast and Central Railway; 219. Crystal Palace New Railways; 220. Dumfriesshire and Cumberland (Solway) Junction Railway; 221. Herne Bay, Hampton, and Reculver Fishery; 222. Hoylake Railway; 223. Kilkenny Junction Railway; 224. Scarborough, Whitby and Staithes Railway; 225. Swansea and Oystermouth Railway)—Board of Trade Reports.
108. Fanning Institute (Waterford)—Return.
Captain Grant (Cooking Apparatus)—Report of a Committee on his claims for remuneration.

Delivered on 11th March, 1864.

1. Weights and Measures (Metropolis) Return.
62 (1). Committee of Selection—Second Report (a corrected copy).
70. Salmon Fisheries (Scotland)—Return.
4. Derby County Union—Return.
17. Bills—Election Petitions.
41. Naval Prize.

Delivered on 12th and 14th March, 1864.

73. Poor Law (Workhouse Dietaries)—Return.
87. Railway Schemes (Metropolis)—Report and Evidence.
55 (2). Railway and Canal Bills—Third Report from General Committee.
62 (2). Committee of Selection—Third Report.
103 (2). Civil Services, Estimates—Class 2.
114. Civil Services (Votes "on Account")—Estimates.
109. East India (Paper Currency, &c.)—Return.
Denmark and Germany (Schleswig and Holstein)—Reports from Mr. Ward and Vice-Consul Rainalls.

Delivered on 15th March, 1864.

19. Railway and Canal, &c., Bills (226. North Eastern Railway (Additional Powers); 227. North Eastern Railway (York and Doncaster Branch)—Board of Trade Reports.
103 (6). Civil Services (Estimates)—Class 6.
110. Sugar Duties (Mauritius)—Copy of Despatch.
112. Constabulary (Ireland)—Return.
120. Superannuation (Sir Rowland Hill—Treasury Minutes.
Education (Endowments)—Minute of the Committee of Privy Council.
North America (No. 6)—Correspondence respecting the "Tuscaloosa."

Delivered on 16th March, 1864.

12 (1). Population and Deaths—Return.
91. Highways Act—Return.
113. Wick Harbour—Correspondence.
99. East India (Sedashegur Harbour)—Return.
Census of Scotland (1861)—Vol. 2.

Delivered on 17th March, 1864.

19. Railway and Canal, &c. Bills (228. North Eastern Railway (Leeds Extension); 229. Blyth Dock; 230. Cannock Chase and Wolverhampton Railway; 231. Central Wales and Staffordshire Junction Railways; 232. Exmouth Docks; 233. Falmouth Docks; 234. Guildford and Leatherhead Railway—235. Irish North Western Railway; 236. Llandilo and Teiffi Valley Railway; 237. Lymington Harbour and Docks; 238. New Brighton Pier; 239. Stokes Bay Railway and Pier; 240. West London Docks and Warehouses)—Board of Trade Reports.
13. Metropolitan Board of Works—Report.
42. Banda and Kirwee Booty—Return.
44. Bills—Intoxicating Liquors.
50. ,, Union Relief Aid Acts Continuance.
Public Schools and Colleges—Report, &c., &c., Vols. I., II., III., and IV.
China (No. 3)—Papers.

Delivered on 18th March, 1864.

85. Election Petitions—Return.
89. Lighthouses, &c.—Report to the Board of Trade.
121. Public Parks, &c.—Return.
103 (5). Civil Services (Estimates)—Class 5.
103 (7). ,, ,, Class 7.
116. Union Assessment Committee Act (1862)—Return.
35. Bills—Grand Juries (Ireland).
47. ,, Borough Franchise.

SESSIONAL PRINTED PAPERS.

Delivered on March 19, 21, 22, 23, 24, 26, 31, *April* 1, 2, *and* 4, 1864.

19. Railway and Canal, &c. Bills (241. Albert Bridge and Approaches; 242. Bembridge Railway, Tramway, and Pier; 243. Edinburgh and Leith Sewerage; 244. Fleetwood Docks; 245. Millwall Canal, Wharfs, and Graving Docks; 246. Newcastle-upon-Tyne and Gateshead Gas; 247. North Devon and Somerset Railway; 248. Port Glasgow Harbour; 249. Tralee Canal; 250. Victoria (London) Docks; 251. Wandsworth and Fulham Bridge; 252. Waterford and Wexford Railway and Rosslare Harbour)—Board of Trade Reports.
88. Ecclesiastical Commission—Copy of Two Reports by Estates Committee.
126. Malt and Beer—Returns.
128. Lunatic Paupers—Return.
129. Registration of Works of Literature, &c.—Return.
107. Metropolitan Board of Works—Return.
134. Roman Catholic Burial Ground (Sydenham)—Return.
84. West Riding of Yorkshire Assizes—Return.
151. Harbours of Refuge—Correspondence.
93. Holyhead Harbour (Communications, &c.)—Return.
102. Holyhead Harbour (Vessels Wrecked, &c.)—Return.
139. Chain Cables and Anchors Bill—Report of Select Committee.
146. Sir Rowland Hill—Copy of a Letter, &c.
154. Piers and Harbours (Provisional Orders)—Report of the Boarp of Trade.
119. Metropolitan Police (1863)—Accounts.
122. Royal Dublin Society—Return.
127. Berwick-upon-Tweed Election—Minutes of Evidence.
137. Shipping—Returns.
138. Registration of Designs—Return.
140. Standing Orders—Report (Sheffield, Chesterfield, and Staffordshire Railway).
155. Friendly Societies—Account.
123. (I). Savings Banks—Return.
130. Spirits—Return.
82. East India (Native Princes)—Returns.
123. Saving Banks—Accounts.
125. Gulf of St. Lawrence, &c.—Return.
135. Poor Law (William Adey)—Return.
141. Railway Companies' Powers—Report from Committee.
147. Highway Officers and Highways Act—Return.
160. Salmon Fisheries (England and Wales)—Third Annual Report of the Inspectors.
115. Standard Weights and Measures—Return.
133. East India (Bullion)—Return.
66 (II). Trade and Navigation Accounts (29th February, 1864.
142. Grain—Report from the Commissioners of Customs.
156. Cashel, Emly, &c., Dioceses—Return.
157. National Education (Ireland)—Return.
103 (I). Civil Services, Estimates—Class I.
131. Dockyards (Timber and Timber Materials and Stores—Return.
132. Dockyards (Accounts)—Return.
46. Bills—Chain Cables and Anchors (amended by the Select Committee).
48. — Jersey Court.
52. — Chief Rents (Ireland).
53. — Bank Notes (Scotland).
54. — Warehousing of British Spirits (amended).
49. — Registration of County Voters (Ireland).
55. — Factory Acts Extension.
56. — Life Annuities and Life Assurances.
57. — Collection of Taxes (amended).
58. — Costs Security.
Chancery Funds Commission—Report.
North America (No. 7) (Enlistment of British Seamen at Queenstown on board the *Kearsage*)—Correspondence.
North America (No. 8) (Recruitment in Ireland)—Correspondence.
New Italian Tariff—Rates of Customs Duties, &c.
Iron Structures—Report by Mr. Fairbairn to the Board of Trade.
China (No. 4)—Commercial Reports.
Japan (No. 2)—Correspondence.
North America (No. 9)—Papers relating to the Seizure of the *Chesapeake.*'
Denmark and Germany (No. 5)—Correspondence respectin Holstein, Lauenburg, and Schleswig.
Affairs of Denmark (1850–53)—Correspondence.

SESSION 1863.

540. Union Assessment Committees—Return.

Delivered on 5th April, 1864.

124. Court of Probate (London and Dublin)—Account.
Church Estates Commissioners—Thirteenth Report.
Barrack and Hospital Commission—Report on Ventilation of Cavalry Stables.
Ecclesiastical Commissioners for England—Sixteenth Report.

Delivered on 6th April, 1864.

49 (1). Navy (Labour Charts)—Return.
148. Prisoners, &c.—Return.
151. Harbours of Refuge—Copy of Correspondence.
Polynesian Islands—Correspondence respecting Removal of Inhabitants to Peru.

Delivered on 7th April, 1864.

163. Sugar—Account.
United States—Treaty for the Settlement of the Claims of the Hudson's Bay and Puget's Sound Agricultural Companies.

Delivered on 8th April, 1864.

104. Revenue Departments—Estimates.
59. Bill—Copyright (No. 2).

Delivered on 9th and 11th April, 1864.

19. Railway and Canal, &c. Bills (253. Bristol Central Station and Railways; 254. Bristol Port and Channel Docks; 255. Bristol Port Extension Railways; 256. Dublin Grand Junction Railway; 257. Dublin Metropolitan Railway; 258. Dublin Railway; 259. Dublin, Rathmines, Rathgar, &c. Railways; 260. Dublin Trunk Connecting Railway; 261. Great Southern and Western and Midland Great Western Junction Railway; 262. Harwich Corporation; 263. London Docks, Saint Katherine Docks, and Victoria (London) Dock Amalgamation; 264. Oswestry, Ellesmere, and Whitchurch Railway (No. 2); 265. Regent's Canal (Limehouse Basin); 256. Saint Helen's Canal and Railway)—Board of Trade Reports.

118. Police (Counties and Boroughs)—Copies of Memorials.
43. Education (Examination at the Training Colleges)—Returns.
161. Spirits—Returns.
164. Paper, &c.—Returns.
165. Parish Assessments (Middlesex, &c.)—Returns.
175. Kitchen and Refreshment Rooms (House of Commons)—Report.
176. North America (Munitions of War)—Account.
191. Army (Yeomanry Cavalry)—Supplementary Estimate.
Public General Acts—Caps. 1, 2, 3, 4, 5, and 6 (delivered on 6th April, 1864).

Delivered on 12th April, 1864.

145. Kagosima (Armstrong Guns)—Admiral Kuper's Report.
50. Prisons (England and Wales)—Return.
177. Capital Convictions—Return.
178. Training and Model Schools (Ireland)—Return.
188. Spirits, Wine, Sugar, &c.—Return.
189. Printing of Papers—Copy of Treasury Minute.
Persia (Construction of a Telegraph Line)—Correspondence.

Patents.

From Commissioners of Patents Journal, April 15th.

Grants of Provisional Protection.

Aerial machine—748—W. E. Gedge.
Air, apparatus for heating—790—T. Waller.
Alcohol, registration of—856—E. T. Hughes.
Animal black, apparatus for revivifying—754—R. A. Brooman.
Armour plates, construction of—764—E. Hill.
Armour plates, manufacture of—816—C. Sanderson.
Artificial fuel—848—R. A. Brooman.
Boots and shoes, apparatus for polishing—704—T. J. Searle.
Boots and shoes, manufacture of—714—C. Hill.
Braiding machinery—540—G. T. Bousfield.
Bricks, &c., pulverising clay for—634—J. Platt and W. Richardson.
Bricks, tiles, &c., apparatus for making—720—P. Effertz.
Cables, &c., chains for—844—J. Roberts.
Calendering, mangling, &c., apparatus for—854—D. Stewart.
Cannon, &c., hoops used in the manufacture of—787—D. Treadwell.
Carding engines—776—E. Grether.
Chimney tops and ventilators—694—G. F. Chantrell.
Clocks, &c., spring barrels for—692—J. Genevrier and P. E. Bidaux.
Combs and brushes—792—R. Douglas.
Cotton seeds, treating a product from the oil of—783—C. Doughty.
Dyeing, &c., blue colour for—286—W. and W. H. Watson.
Engines, traction and hauling—750—W. Roberts.
Fabrics, dyeing of—690—L. A. Durrier.
Fibres, machinery for combing—757—A. Staples.
Fibrous materials, engines for carding—808—J. Bickerton.
Fibrous materaials, frames used in preparing—802—J. Prestwich, jun., and W. Brooks.
Fibrous materials, machinery for spinning—684—J. and J. Horrocks.
Fibrous materials, mules for spinning, &c.—850—J. Platt and E. Spencer.
Fibrous materials, presses for packing—734—W. Routledge and F. F. Ommanney.
Fibrous substances, apparatus for preparing, &c.—846—M. J. Roberts.
Fibrous substances, preparing and spinning—742—J. and J. Wild.
Fire-arms—670—P. A. L. de Fontainemoreau.
Fire arms, breech-loading—752—S. Matthews.
Fire-bars, mounting and giving motion to—706—W. A. Martin and E. Wylam.
Fire grates—777—S. Harrison and W. Clements.
Flax and hemp, heating the contents of vats for steeping—716—G. and C. Firmin.
Gasaliers, slides for—746—S. Bark, T. Attwood, and J. D. Robinson.
Gas burners—755—V. Dubourg.
Gas generating apparatus—806—R. A. Brooman.
Gas lighting and ventilating apparatus—675—E. T. Wakefield.
Grain, machine for hulling—779—W. E. Newton.
Gun carriages, apparatus used with—722—G. T. Bousfield.
Hair brushes, rotatory—794—R. Douglas.
Hair brushing, apparatus for—804—W. Holbrook.
Hair-cutting apparatus—864—R. Douglas.
Hats, &c., manufacture of—756—W. Clark.
Irons, smoothing and pressing—730—F. Tolhausen.
Knitting machines, circular—814—T. Coltman.
Land, machinery for cultivating—818—A. Macrae.
Looms—682—D. Dalglish.
Looms—688—J. Edmondson and T. Ingram.
Looms—724—S. Berrisford and W. Ainsworth.
Looms—780—H. Holden and E. S. Forshaw.
Looms—788—T. Allan.
Looms—810—J. Bullough.
Lubricating apparatus—686—W. Clark.
Macerating vessels—698—G. Kershaw.
Marine steam-boilers, self-acting apparatus for—696—J. Burrell.
Marine steam engines, condensing the steam of by external surface—743—R. H. Wright.
Matches, manufacture of—766—E. Pace.
Messages, sounds, &c., apparatus for conducting—744—E. Leak.
Metallic packings—3088—T. A. Blakeley.
Metallic surfaces, &c., plastic compound for the protection of—728—F. L. Roux.
Military knapsacks, &c.—838—T. Brown.
Mines, ventilation of—762—E. Lever.
Mines, ventilation of—786—J. Lang.
Mining, &c., blasting for—775—I. M. Evans.
Moulding—736—T. H. Head and H. Smith.
Music printing, &c.—774—T. B. Harpur.
Paddle-wheels, construction of—840—W. E. Newton.
Paper, manufacture of—834—L. Cooke.
Piers, sea walls, &c., foundations for—836—G. R. Stephenson.
Plates, tubes, &c.—320—M. C. de Casteras Sinibaldi.
Pneumatic railways and tubes—758—T. W. Rammell.
Propulsion, mechanism applicable to—860—H. G. Fuller.
Pumps—708—E. Borrows.
Railway carriages, &c.—652—T. Chamberlayne.
Railways, &c.—572—W. Moir and C. E. Serjeant.
Reaping and mowing machines—726—D. H. Barber.
Reservoirs, construction of—830—T. H. Head.
Respiratory apparatus—668—J. Carrick.
Revolver fire-arms—760—G. T. Bousfield.
Ribbons, manufacture of—710—P. Berghans.
Rocks, &c., apparatus for boring—795—W. E. Newton.
Rods, bars, &c., bending or straightening of—718—J. Bennie, jun.
Rollers &c., coating the surfaces of—842—E. K. Dutton.
Rotatory-engines—862—G. Smith.
Rudders—824—J. T. Fitzmaurice.
Sails, reefing and stowing—761—M. Clough.
Scenic effects, apparatus for producing—826—W. Callcott.
Ships, construction of—771—M. Scott.
Silk waste, &c., preparation of—759—J. Warburton.
Smoky chimnies, apparatus for curing—822—J. Capper.
Steam engines—798—W. Martin and J. Hodgson.
Steam generators, feeding of—828—E. U. Parod.
Steam, means of generating—812—A. Prince.
Steam ships, &c., propelling of—554—J. Lockwood and J. Wetherill.
Stocks, neck-ties, &c., fastenings for—740—G. Couchman.
Stoking shovels, &c.—852—J. H. Johnson.
Stones and minerals, machinery for breaking—784—H. Smith and E. Roberts.
Sugar moulds—700—D. Jones.
Table covers, &c.—793—J. Williamson.
Textile fabrics, apparatus for tentering, &c.—768—J. Coulter and J. A. Barber.
Textile fabrics, beetling or finishing—796—R. Ferguson and W. Lattimer.
Washing machines, &c.—623—J. Crompton.
Watches—570—C. E. Laederich.
Water, supplying air to persons employed under—770—M. Henry.
Wood, &c., machinery for turning, &c.—797—H. Bayley, L. Newton, and J. Greaves.
Woollen fabrics, machinery for cleansing—712—F. T. Moison.
Woollen shirts, &c.—702—C. Billson.
Yarns and threads, composition for sizing—782—A. Heald.

Inventions with Complete Specifications Filed.

Gunpowder, manufacture of—900—E. Dronke.
Sewing machine—921—W. N. Wilson.

Patents Sealed.

2551. F. de Wyldé.
2552. J. Champion.
2559. J. Taylor, and J. and J. Lees.
2561. W. Ingham and I. Wood.
2575. C. Garton and T. Hill.
2578. W. Hartcliffe.
2585. G. Haseltine.
2587. R. A. Brooman.
2595. J. Craven and S. Fox.
2608. R. Bridson and J. Alcock.
2620. J. Parker.
2630. W. Locke, J. Warrington, W. E. Carrett, W. E. Marshall, and J. Telford.
2641. M. Vian.
2716. J. Macintosh.
2778. M. Mellor.
2896. W. B. Adams.

From Commissioners of Patents Journal, April 19th.

Patents Sealed.

2590. J. Dodd.
2592. G. Cutler, jun.
2598. J. W. Friend and B. F. Weatherdon.
2603. A. Kinder and J. Inglis.
2604. B. Noakes and F. J. Wood.
2605. C. J. Pownall.
2606. W. W. Burdon.
2607. R. A. Brooman.
2611. J. L. Jurgens.
2613. M. A. Boyle.
2616. J. T. Webster.
2617. J. Ronald.
2624. E. S. Crease.
2625. J. Davidson.
2629. J. Brown, J. T. Way, and T. M. Evans.
2631. L. J. Hannart.
2657. E. R. Hollands.
2670. W. Nall.
2682. J. Haworth.
2692. W. Verran.
2697. H. B. Barlow.
2710. F. J. Vandenvinne.
2854. J. Lewis.
3062. J. H. Johnson.
430. G. H. Johnson.
433. T. Jackson.

Patents on which the Stamp Duty of £50 has been Paid.

981. J. B. J. Noirot.
993. E. D. Bourne and P. Davis.
927. F. Gye.
943. W. A. Dixon.
1006. P. Ward.
956. A. V. Newton.
973. W. Hudson and C. Catlow.

Patents on which the Stamp Duty of £100 has been Paid.

1054. B. O'N. Stratford.
1070. J. Safran.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, APRIL 29, 1864. [No. 597. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

MAY 4th.—"On the Testing of Chain Cables." By FREDERICK ARTHUR PAGET, Esq., C.E.

CANTOR LECTURES.

The concluding lecture on "Chemistry applied to the Arts" will be delivered by Dr. F. CRACE CALVERT, F.R.S., on Thursday evening, at 8 o'clock, as follows:—

MAY 5.—LECTURE VI.—ANIMAL LIQUIDS.—*Bile*, its purification and detergent properties. *Blood*, its application in the refining of sugar and the manufacture of albumen. *Albumen*, its use in calico printing and photography. *Urine*, its uses. *Milk*, its composition properties, falsification, and preservation. A few words on putrefaction.

ALBERT MEDAL.

The Gold Medal established by the Society in memory of its late President, the Prince Consort, to be called the "Albert Medal," and to be bestowed, from time to time, "For distinguished merit in promoting Arts, Manufactures, and Commerce," has been adjudged to Sir Rowland Hill, K.C.B., in recognition of his eminent services to all classes of the community in the creation of the Penny Postage System and other Postal reforms. The following letter has been received from Sir Rowland Hill:—

Hampstead, N.W., April 22, 1864.

SIR,—I have the honour to acknowledge the receipt of your letter of yesterday's date, informing me that the Council of the Society of Arts have awarded to me the "Albert Medal," in recognition of my services in connexion with Postal Reform.

I beg you will do me the favour to express to the Council my grateful acknowledgments of the honour which they have been pleased to confer upon me—an honour which, whether with reference to the high character of the Society in whose name the award is made, or of the lamented Prince in whose memory the medal has been established, will ever be held by myself and my family in the highest estimation.

I have the honour to be, Sir,
Your most obedient servant,
ROWLAND HILL.

P. Le Neve Foster, Esq.,
&c., &c., &c.

Proceedings of the Society.

NINETEENTH ORDINARY MEETING.

Wednesday, April 27th, 1864; Sir Thomas Phillips, F.G.S., Vice-President of the Society, in the chair.

The following candidates were proposed for election as members of the Society:—

Buss, Thomas O. L., 33, Hatton-garden, E.C.
Chifferiel, Frederick, Dulwich, S.
Clarke, John Joseph, 54, Chancery-lane, W.C.
Hook, A. Clarke, Worcester-park, Kingston, S.W.
Hook, F. C., 13A, Great George-street, S.W.
Jeffries, George, Woolwich, S.E.
Kirkman, Gardinelli S., 27, Claremount-terrace, Fentiman's-road, South Lambeth, S.
Lefeuvre, W. H., 18, Great George-street, S.W,
Martin, Charles Wykeham, 25, Cumberland-street, Hyde-park, W.
Ordish, R. M., 18, Great George-street, S.W.
Parkyns, Sir Thomas G. A., Bart., 9, Gloucester-sq., W.
Reibey, Archdeacon Thomas, 38, Gloucester-terrace, Hyde-park, W.
Smith, W., 11, Staple's-inn, Holborn, E.C.
Stephens, Gilbert, 13, Northumberland-st., Strand, W.C.
Thompson, Charles Edward, 8, Colet-place, Commercial-road, E.
Webb, Francis, 31, Southampton-buildings, Chancery-lane, W.C.

The following candidates were balloted for and duly elected members of the Society:—

Farries, R. Spearman E., 13, George street, Mansion-house, E.C., and 10, Basinghall-street, E.C.
Mostyn, Charles, 8, Cornwall-villas, Westbourne-park, W.
Yeats, Anthony George, Collinson-house, Effra-road, Brixton, S.

AND AS HONORARY CORRESPONDING MEMBER.

Menn, Charles, Secretary of the Institute of Science, Geneva.

The adjourned discussion on the paper "On the Patent Laws," read by Mr. Thomas Webster, F.R.S., at the last meeting, was resumed by

MR. NEWTON WILSON, who said it had been a matter of some surprise that the principle of the patent law should, at this stage of our national history, be called in question, while it was a thing which had been admitted by, he might say, every civilised nation in the world, and by almost every semi-civilised nation, as a necessity of advancing civilisation. He took it that, as a nation advanced in civilisation and in arts, the necessity of giving some encouragement and some protection to the products of inventive genius was absolutely necessary. In what they

might call semi-civilised nations, such as Brazil, Chili, and Mexico, patents were given without any government duty whatever; and why? because they found it necessary to give assistance to enterprise and encouragement to the introduction of new inventions in those countries. Gentlemen who objected to the patent law on principle might, with equal justice, object to the legislation recently adopted for the security of trade marks. On the same principle, he could imagine objections to the law of copyright and the registration of designs. He believed that nine-tenths of the members of this Society, if not ninety-nine hundredths of the manufacturing community, would endorse the principle of the patent law, though perhaps they would say it was objectionable in many of its details. There were unquestionably many anomalies in connection with that law. We demanded from the poor inventor a larger sum than was called for in any other part of the globe for what was called the protection of his primitive efforts. If it paid France or Belgium to take a small annual payment, in the one case of £4 a year, and in the other of only 10 francs, surely it would be sufficient for the purposes of this country if a corresponding scale were adopted, and he thought it would be found desirable to adopt—not the scale they had now of instalments, which prevented so large a number of patents from reaching the maturity of the final specification and the Great Seal. He thought that system would have to be considerably modified. The payment of a single £5 ought to be quite sufficient to complete a patent, and to meet all the demands of the government, and if an annual payment of a similar amount were adopted, he believed it would bring a larger amount of revenue than at present, while it would be exacting from the inventor a continuous payment for a continuous interest which he derived from his patent. A particular feature in Belgium was that the patent fees increased year by year on the principle that the patentee was deriving a yearly benefit from his property. He would refer to one or two anomalies in connection with patents. They had at present an arrangement by which it was presumed patents were examined, and it might be imagined that a patent which was not good would not be granted, seeing it had to pass through the hands of the Attorney or Solicitor General, and fees had to be paid; but this practically afforded no actual check. A large amount of the fees paid by inventors went into the pockets of the Attorney and Solicitor General, for such services as, he maintained, were totally inadequate. What, then, did they want? He maintained that they wanted a Board of Examiners, who should really examine into the invention and decide whether it was really new, and so avoid the granting of useless patents. They would also be able to tell whether the specification was sufficient. If that were done we should be saved from much uncertainty and litigation. The next point was the mode of trying patent cases. It appeared to him that for this to be properly conducted with advantage to both sides, there must be a special tribunal. He would have no juries in this court, for it was one where special knowledge was required. There was another point. It would appear that the present patent laws were enacted with a special view to guard the public. It was said by a very able speaker at the last meeting—the Chairman of the Council—that the public were not considered in the provisions of the patent law. He (Mr. Wilson) maintained that they were far too much considered, and that the interest of the inventor was too much disregarded. He maintained that the patent law was so constructed that if an inventor made a mistake in his patent he had the utmost difficulty in correcting it. There was no provision for revising his patent. There was a provision of disclaimer, but that was at the option of the Attorney-General, and, as Mr. Webster knew perfectly well, the Attorney-General might refuse a disclaimer, and then where was the inventor? But the very provision of the disclaimer as it at present existed was defective. It provided that certain words might be struck out, but it allowed the insertion of nothing that would clear the patent of the mystery that previously surrounded it. Another point of importance was patents of importation. In many countries of Europe, and in some of South America, patents of importation were allowed, but the same privileges did not extend to them as were allowed to patents of absolute invention. Here, however, the rights were the same, and the importer might prevent the real inventor from afterwards obtaining protection for his own invention. He knew cases in which the grossest injustice had been inflicted on inventors in that way. He had even known instances in which the inventor had been obliged to purchase the patent back at an enormous cost. Such a state of things, he said, ought to be remedied. It was alleged, at the previous meeting, by Dr. Bachhoffner, that inventors often made it their business to obscure the specification, so as not to allow the real objects of the invention to be clearly shown. From his (Mr. Wilson's) experience this rather arose from the shortcomings of the patent agents, and he thought that if they had such a court of examiners as had been suggested, it would lead to much greater care on the part of patent agents, and he thought that patent agents themselves should be bound to pass through some curriculum before they put themselves before the world in this capacity. One other point of importance was the necessity for a Patent Museum in this country. Why should we not have something like what they had in the States of America? He conceived the Society of Arts could not do better than to appoint a committee to confer as to the best means of introducing an improved patent law, the provisions of which should, far more than the present one, meet the wants of inventors, manufacturers, and the public.

Mr. Steere remarked that the word "patent" suggested many points for consideration; one was that every patentee was grievously oppressed by law proceedings, as was also the infringer. Now, what was the question to be tried between the parties? It was simply a mere matter of fact, which should be tried before a tribunal of experts (say a committee of the Society of Arts), and the only parties examined should be the patentee and his workmen on the one side, and the alleged infringer and his workmen on the other. But, as it now stood, the lawyer intervened, and, putting aside matters of fact, argued upon matters of law. It was then often discovered, upon legal reasoning, that the specification was insufficient. So little value did he (Mr. Steere) attach to the specification that he would abolish it altogether. The simple fact to be decided was, whether an invention was an infringement of a former patent, and to determine that question what consequence was it in what terms the invention was described? By some such plan as he suggested they would relieve both parties of the enormous expenses which attached to the present system of litigation. The case of "Young and Fernie" was a remarkable instance. He would offer another suggestion, which was, that the word "patent" should be dropped altogether, inasmuch as so long as it was retained they never would get rid of litigation. He would prefer that the term "licence" should be used. He contended that the present system of litigation of patent rights required to be placed upon a totally different footing.

Mr. Murdoch said it would take up too much time if he were to attempt to answer the arguments of those who opposed the patent system, or to unravel the intricacy of the statistics which they brought forward. He would, therefore, restrict himself to a few remarks respecting the means proposed for the remedying of evils attendant on that system. He entered upon the subject with diffidence, as he should have to call in question the policy and practicability of the course advocated in Mr. Webster's able paper, respecting the mode of granting letters patent. It was proposed to subject all applications for patents to a preliminary inquiry, made by a tribunal having power to refuse the patent in the case of want of novelty or merit in the invention to be protected.

Mr. Webster said he did not intend that the question of merit should be submitted to such a tribunal.

Mr. Murdoch continued: Now, it seemed to him that such a tribunal would, both in its principle and practical working, be in direct opposition to the spirit of patent law, the chief merit of our present system consisting in the fact of its being an equitable arrangement between the inventor and the public, by which the reward received by the former was in proportion, in some cases, to the benefit conferred by his invention; in all, to the commercial value which attached to any new means for supplying the wants or contributing to the luxuries of society. Further, if property in inventions was to be protected at all, it must be placed upon the same footing as other property, and be secured to its possessor without reference to its value. Every new invention, whether of great or small importance, was deserving of State protection, and the mode of conferring that protection by letters patent was the fairest both to the public and the inventor. If his invention were valuable, it was but right that he should enjoy the profits resulting from its use. These the law secured to him. If, on the other hand, his invention were of trifling value, the hardship (if any), suffered by others in being forbidden to exercise it, was but small. But if the invention were useless, there were provisions of the law which would meet the case by rendering the patent void, although the patenting of even a useless invention was attended by this beneficial result, that it placed upon record that which had been done in a manufacture, so that that which had been a stumbling block in the path of one inventor often became a stepping stone by which subsequent inventors attained success. But if the expediency of making the proposed distinction between inventions were to be granted, he did not see how the principle could be carried into practice. Nine out of ten of the inventions which annually became the subject of patents were necessarily in a state of infancy when the patents were applied for. This fact was recognised by the law, which granted an inventor provisional protection for six months, in order that he might make such trial of his invention as should satisfy him as to its value, and enable him to describe his invention in its most perfect form in his final specification. If, therefore, the utility of an invention were to be inquired into before the grant of protection, the inventor would be under the disadvantage of having to submit his invention for examination with all those imperfections which could only be removed by repeated experiments, and it would be judged of theoretically instead of upon its practical merits. The examiners, also, however capable and impartial they might be, would, owing to deficiency of evidence, find it difficult to do justice to the cases submitted to them. They would have to try questions of far greater importance than those which were tried by our present tribunals, for, whereas these decided whether an asserted right should or should not be maintained, the examiners would have to decide whether a man should have the power of asserting his right at all, and in doing this they would be without the facilities which were now afforded in our courts of law by the examination of witnesses conversant both with the old methods of practising a manufacture and with the new method in dispute. Mr. Murdoch instanced the well-known case of Betts *v.* Menzies in illustration of this part of his argument. In this case it was contended that Betts's patent was bad because the invention it protected was described in the specification of a prior patent, and it was not till the case had gone from court to court that Betts's patent was decided to be good. Now, all this litigation arose from the similarity of Betts's and Dobbs's specifications, which was such, that if Betts, in order to obtain his patent, had been required to submit a description of his invention for preliminary examination, the patent would, in all probability, have been refused, on the ground that his invention had been anticipated by Dobbs; and although the practical difference between the two inventions was exactly that between success and failure, he would have been deprived of his reward. This was but one of many cases which might be cited, to show the injustice which would be inflicted upon inventors, and the loss which would be sustained by society, if the novelty or merit of an invention were to be investigated before the grant of the patent, although he was willing to admit that, in some cases, the difficulties which he had suggested would be met by the plan proposed by Mr. Wilson, which he took to be this—that the usual provisional protection (six months) should be issued, but that the novelty and utility of the invention should be inquired into previously to the sealing of the patent. There were cases, however, in which years elapsed before the invention was brought into satisfactory operation, and to such cases Mr. Wilson's proposition would not apply. It had been said that the action of the preliminary tribunal would be analogous to that of the Privy Council in prolongation cases. There would, however, be this difference—the Examiners would have to decide on such evidence as might be collected during a period of a few months, whereas the Privy Council based its decisions on evidence that had been accumulating during the whole term of a patent. He did not think, however, that we need trouble ourselves to devise any system of preliminary examination, as the part of our patent system requiring reform was, not the mode of granting patents, but the mode of trying patent cases. The trial of a patent case was now so tedious, so expensive, and so uncertain, that men would often suffer wrong rather than go to law to obtain redress. The consequence of this state of things was, that inventors often took out patents without making due inquiry respecting the novelty of their inventions, and filed vague specifications, relying on the reluctance of others to contest their claims in a court of law, whilst, on the other hand, patents were often infringed by manufacturers and others, who hoped to wear out the patentees by the help of a long purse. In both cases capital became but too frequently a means of oppression. There were provisions of the present law which, if they could be readily and effectively administered, would be amply sufficient to meet such cases. There were remedies of the patentee against the public, and *vice versâ*. The difficulty was that in applying these remedies the whole case turned upon the construction of the specification, which was a duty to which our courts, as at present constituted, seemed to be unequal. The remedy was to be found in the strengthening of the court, as set forth in Mr. Webster's second proposition, viz., "That the validity and infringement of patents should be tried by a judge, assisted by two or more assessors, conversant with the subject." He thought it would be very advantageous to extend the functions of this court to the granting and extension of patents. The court would then perform the duties which were now performed by the law officers, our courts of law, and the Privy Council. The advantages of this arrangement would be that those who examined applications for patents would not go out of office with each change of ministry, by which system their experience in matters of patent practice was at present lost to the public, and the court would be fully acquainted with the history of each patent granted.

Mr. G. W. Hastings had listened with interest to the opinions that had been advanced on this subject by practical men who had taken part in the discussion. He confessed, as far as he was personally concerned, he had no other pretension to speak upon the matter beyond that of strict impartiality. He had no personal interest in it whatever, and he simply represented the interest which after all would have to finally settle this great question—that was the interest of the public. He thought it rather unfortunate that one or two of the speakers had, probably in the heat of argument, thrown some doubt on the right of the public to have any interest in the question. Now he had every respect for the interests of patentees, but he thought the public had a right to be heard in the matter.

It seemed to have been assumed by the gentleman (Mr. Spencer) who on the last occasion spoke in reply to the very admirable speech of Mr. Hawes, that if they once conceded that there was a property in invention, they at once settled the whole question, and that therefore the present patent law was always to be maintained. He begged to deny in the most explicit manner the force of that argument. He was fully impressed with the feeling that there was a property in invention, and that that property ought to be maintained. He thought when a great inventor gave to this country the benefit of some discovery, he was deserving of very high reward, and his merits ought to be recognised, but he did not see, while acknowledging that, that there was any necessity to maintain the present or any patent law at all. Let them go for a moment into this question. The gentleman who opened the discussion this evening told them that the patent law and the copyright law stood on precisely the same grounds. Now, he (Mr. Hastings) could hardly imagine two things more diverse, and it was from that misapprehension partly that so many errors had crept into the subject. He would give them an instance of the difference between copyright and patent law. When Sir Walter Scott wrote his "Waverley," he introduced into this country an entirely new species of literature—historical romance—and he obtained the copyright of that work, and it would have been piracy to have reprinted it *ipsissimis verbis*; but they did not by that grant to Sir Walter Scott a monopoly in the printing of historical romances. They did not say that for a certain number of years he should be the only person in this country to produce novels of that description. They allowed any one who chose to write historical romances; but the principle of the patent law was that they should confer upon one man who had invented a particular thing an absolute monopoly in it. The point he arrived at was this—granting there was a property in invention, was the present system of patent law the best system for securing that property either as regarded the inventor or the public? He would deal with the question first as regarded the public. In ancient times it was considered that if an enterprising navigator discovered a new country, the only proper way to reward him was to make him a grant of that country; but in process of time it was discovered that the better plan of reward was to give a suitable recognition of the discovery and throw the land open to public use and occupation. Much the same question was involved in the patent law—whether there was not a better way of rewarding than giving a monopoly? The argument on public grounds had been that by granting patents they encouraged invention. But what did one speaker say?—That under any circumstances they would have invention—that invention, once in the head, it must come out. He quite subscribed to that. He believed the faculty of invention was like the faculty of poetry, or of art, and if a man had that genius within him he was sure to invent. If that were true, as the gentlemen in favour of the patent law had informed them, it seemed that the case of the patent law, as far as the public was concerned, fell to the ground; for it was clear the public had the benefit of the invention, whether they rewarded the inventor or not. In that case every shilling paid in fees to the patent office was so much useless burden upon the public, for, after all, it came out of the public purse. It seemed to him, as far as the public was concerned, the patent law, on its present footing, was wholly indefensible. He would now consider the question from the inventors' point of view. Was the granting of a monopoly the best means of rewarding him? If there was any truth in the facts and figures of Mr. Hawes it seemed a bad way of rewarding him. It seemed to create a lottery in which very often the best man lost and the worst man won. It seemed a mode of rewarding which might not only fail in its object, but might lead the unfortunate inventor to spend his whole life in an idle pursuit of riches. He thought, as far as the inventor was concerned, a more satisfactory plan would be that each invention should be valued by a competent tribunal, and that it should be rewarded by a certain sum at once from a public fund, upon its being declared to be a true and really good invention. That would surely be a more certain and, he apprehended, a more satisfactory plan than the present system of patents, and he thought this the more, because he could not help feeling how inadequate had often been the rewards to really great inventors of this country under the present patent law. Large fortunes had often been made by men whom it would be ridiculous to term inventors—men who had made some trifling modifications, while those who had conferred illimitable advantages, not only on this country but on the world, had sometimes been left to die in poverty. He trusted he had demonstrated first, that the present system was not satisfactory to the public, and secondly, that it was not so to inventors. If that were the case, he thought the legislature of this country, enlightened by the assistance of this Society, should take the matter into consideration, and enact for the benefit of inventors, as well as the community, a system which would be satisfactory to both, which would give the best reward to genius, and would not deprive the public at large of the free use of the invention.

Mr. Walter Hancock said that the policy and operation of the patent law had been forced upon his attention by an experience of its working for nearly twenty years. No one could deny that that working was unsatisfactory, sometimes grossly unjust; so much so, that it was even possible (as was suggested by Mr. Hawes) for a man to have his invention snatched away from him, and if he neglected to follow it up closely to the doors of the Patent-office to see, by operation of law, the legal title to his property conferred upon another. But this monstrous scandal, although within the letter of the law, was diametrically opposed to its spirit; it was an evil not necessarily inherent in the law, but possible only from its present lax and clumsy administration. To an enterprising manufacturing country like ours, the subject was one of great importance and of great difficulty. The views entertained as to the policy of any law for the protection of patent right were as wide asunder as the poles, for inventors too often insisted that it was the duty of the State to establish a system for their especial and ample protection, overlooking the fact that the law owes duties to the public as well as to the inventor; on the other hand, persons entitled to great weight maintained that the policy of patent right was essentially vicious, and opposed to the principles of a sound economy, inasmuch as it created a monopoly. Between these two extremes there was ample room for a sound and beneficial law. The staunchest opponents of patent right would not deny that the inventor of a new and useful invention was entitled to a substantial reward of some kind. We were told, indeed, by a few that invention, like virtue, would prove its own reward; this would only apply to the pure philosopher, who pursued the study of science for its own sake. We were told that the state should reward inventors, but what was to be the nature of this state reward? A decoration, a riband, or a nomination to a legion of honour? He did not wish to undervalue these acknowledgments, but they were not the considerations that would weigh with the body of our countrymen as a stimulus to invention. Then we were told that the state ought to give pecuniary rewards. He maintained that it would be impossible to work out such a problem either satisfactorily or economically. How difficult it was now to get the Admiralty or any Government body to appreciate or take up any new invention, however valuable. If a department of the state were charged with the duties of examining and dispensing rewards for new inventions, was it not probable that instead of 3,000 we might have 30,000 claimants per annum? And should we not require for this purpose a machinery and a body of experts more extensive and costly than that which was advocated for the preliminary examination of patents?

Another serious objection would be that these rewards would be a heavy charge upon the State, whereas the present law was not only self-supporting, but left a surplus, which, as Mr. Webster justly said, ought to be applied wholly to the encouragement of invention. He could not but come to the conclusion that for the people of this country, who appreciated everything by its value in pounds, shillings, and pence, the only feasible reward was the commercial one, such as was conferred by patent right; because such a reward would usually be as nearly as possible equivalent in value to the benefit which the public themselves (by the purchase of any patented article or process) considered that the inventor had conferred upon them by his invention. Now it was easy to "give a dog a bad name," to raise an unfair prejudice against patent right by stigmatising it as a "monopoly," as a remnant of the laws of olden times. He considered that Mr. Webster had demolished the argument that patents were monopolies, by showing that they deprived the public of no existing right or benefit, because they referred only to new trades or processes created. He (Mr. Hancock) must demur to the proposition of the chairman of the council, that "patent right was a remnant of the law of olden times." Placed side by side with invention, patent law was of comparatively recent date. In olden times there was no patent law; there was no necessity for it; nor was there any necessity for copyright. Inventions were "few and far between," and it was while in the actual enjoyment of that reward for which the author or inventor of the present day had to strive so hard, that many of the great works and inventions of old were completed. To what higher reward could Virgil aspire, when engaged upon his Æneid, than the patronage and bounty of Augustus? Or Horace than that of Macenas? Was it not at the court of Hiero, of Syracuse, that Archimedes made the great discovery of specific gravity? But, if the proposition were correct, that patent right was a remnant of the laws of olden times, that alone would be no argument for its abolition. If we wished to descend from the proud position that we occupy of being the greatest, freest, richest nation in the world, we could not do better than begin by abolishing some of our laws of the olden time, such as trial by jury, which was said to have existed about 1,000 years, Magna Charta for about 650, and Habeas Corpus, which might be said to date from the same century as our patent right. He contended that what was vicious in the olden laws of monopolies was abolished by the Act of 1624, and that the legislature exercised a wise discretion when they excluded from its operation the patents for inventions. So far, therefore, from regarding patent right as a law that ought to be abolished, he looked upon it as a necessity of the present time. This subject had been fully discussed at the meeting of the British Association at Manchester in 1861. Mr. Curtis (then Mayor of Manchester) gave a striking instance of the necessity of a patent law. His firm had spent upwards of £10,000 in the perfecting and introducing a new machine; without a patent right it would have been open for any engineer to have availed himself of all this outlay, and actually to have made and sold the improved machine, and got a profit, at a price at which the inventor himself, with this outlay to make up, could not possibly compete. If the opponents of patent right charged its advocates as monopolists, surely their own principles too nearly approximated to those of the communists. He (Mr. Hancock) could give a more striking instance, drawn from his own experience, of a new invention and manufacture that would not have been prosecuted but for the patent law. About twenty years ago there was introduced into this country and to this Society, a substance new to us—gutta percha—and for the introduction the Society rewarded Dr. Montgomerie with its gold medal. It was introduced as a scientific curiosity, in the hope that means might be devised for rendering it a useful material in the manufactures of this country. Hitherto it had answered no such purpose, although it had existed for probably 5,800 years. It could not be obtained without great difficulty; it was necessary to penetrate tropical forests, inhabited by tigers, at a distance of 15,000 miles from home. It was not, therefore, without considerable labour and enterprise—it was not, in fact, until after the undivided attention of three gentlemen for a period of three years, and the assistance of others, and at a total expenditure of nearly £25,000, that any manufacture for profit could be attempted. He would confidently ask, would the inventors and capitalists have combined to do this but for the protection of the patent laws? What had been the result? The public had been largely benefited by the many purposes to which this substance had been applied, but especially by its application to submarine telegraphy. When we recalled that the old Atlantic cable by one message saved this country upwards of £50,000, that during the Crimean war the Black Sea cable was estimated to have saved this country upwards of £1,000,000, and that besides this we had for 12 years enjoyed submarine telegraphic communication with the continent, it must be obvious that the benefits, direct or indirect, conferred upon the public by gutta-percha were incalculable. He would grant that the gutta-percha patents had produced an immensely handsome reward. He would grant that, as was too often notoriously the case, the bulk of that reward had been reaped, not by the inventors, who conferred the benefit, but by the enterprising company who worked the inventions, and to whom for their enterprise some degree of credit was unquestionably due; but he would firmly maintain that the benefits conferred upon the public had been immeasurably greater than those conferred upon the inventors and their coadjutors, and that in the true spirit and interest of the Patent Law, the contract entered into by the crown on behalf of the public, by which, in return for the invention, the crown granted a patent right for the limited period of fourteen years, was a just and beneficial contract.

Mr. J. A. Macfie said he felt very much honoured and gratified in having the opportunity of being present and listening to the discussion, and he was only sorry that the cause which he espoused had so few advocates in a place where, above all, he should have thought that it would have found friends to support it. He was glad that the hon. secretary of the Association for Promoting Social Science had addressed the meeting so well and so ably, and he was afraid that in having to follow him he should prove the great advantage of professional men over plain men of business. The subject was a very large one, and had been most ably brought before their notice by Mr. Webster, whose paper embraced questions which had been very often debated, namely—right of property in inventions, what reward ought to be given to men of genius and men of skill who benefited the public by their inventions, the present state of patent law in Britain, and the best remedies for the evils which were universally admitted to exist. These subjects could not be considered without also taking into consideration the state of affairs with regard to inventions in other countries with which England stood in relation, and the changes which had come over British commerce and British manufactures by the introduction of free trade. The principle which had been advocated by many in this Society, when reduced to different language, was, that every man who made an invention had a right to prevent others from doing what he had done. That was, in plain terms, the proposition which they were asked to receive. Without going very far into the subject, he would only remark that it was very fortunate for us that we did not live in the days of Adam and his immediate descendants, for then everything was new and everything was an invention, and our race would still have been savages. He could not think that anything which would not apply to such a state of society could be consistent with the Divine law, and since he took such high ground as that, they would allow him to say that he thought that many of

the things which were said on this subject were hardly consistent with the principles of the religion which prevailed in this country. Those who doubted the advisability of this system of rewarding inventors by means of monopolies were not averse to any amount of honours. One of the speakers had rather disparaged honours, but he could say for himself that he would rather have some honour, some acknowledgment from the Queen, some proof that he had served his country, than he would receive a thousand pounds; and he was quite sure that there were many who were influenced by the same feelings. But although they heaped honours on those who really deserved them, yet he was sorry to say that one of the defects of the present system was, that it was no honour to be a patentee, for they were only a class of persons many of whom pretended to be inventors without having done anything at all meritorious or deserving of the privileges which they enjoyed. With regard to the question of property in inventions, he would offer one or two observations to show that, in the ordinarily accepted sense, this could not exist. What was bought was not the invention but the secret. The patent was the recompense, not for the invention, but for the secret, and the proof of that was that a reward was given to any man who imported an invention, and in that case the reward was not for an invention, but for having communicated to the country a secret; therefore the property was not in the invention but in the secret. Canada, acting on this principle, had stipulated that she would give no patent but to those who were resident within her own territories. He only gave this as a proof that, even in our own colonies, where they had got emancipated from the old traditions of our country, they actually acted upon the principle that there was no inherent or natural property in inventions. It occurred to him, however, that our friends on the other side of the Atlantic would show a little more good sense if they would consider the public interest rather more even than that of those favoured few who made inventions. In point of fact, in their way, they did consider the public, because their practice simply amounted to this, that they presented gratuitously to the colonies of Great Britain the produce of all the inventions which we pay for, and thereby hung a thought which required great attention in these times, namely, that the people of Great Britain were throwing upon the manufacturers of Great Britain the great burden of patents, and at the same time, as Mr. Hawes had very properly stated, they were calling upon them to compete, under free trade, with all countries in the markets of the world, and with those who were using our inventions without paying for them, while our manufacturers were obliged to pay the heavy royalties which patentees demanded. What had to be considered was, the best means of getting rid of these heavy burdens, which would prevent Britain from running successfully in the race of commerce. Another proof that there was no natural property in inventions was afforded by our own law, because if there really was any property in an invention it would go to a man's heirs and successors, and would not go from him at the end of the fourteen years; this, however, was not the case, and it plainly showed that this was not what we called "property." Again, another excellent suggestion had been made by Mr. Webster, and was entitled to all the weight which anything coming from him deserved, and that was that there ought to be the privilege of a compulsory sale, which could not, of course, exist in the case of property. The second proposition of our patent laws, when reduced into shape, was that every man who found out a new way of doing a thing, must first undertake a very heavy task. Before a man could use his own invention he must do what would be the work of a lifetime, namely, inquire whether anybody else had the plan patented. If he made any discovery, he must first of all, before he could do anything with it, go to the patent office, and to all the various manufacturers who used the particular machine in connection with which he had made his discovery, and ask them if they had ever seen his way of doing it before. Surely this was a most preposterous state of things! He said it deliberately, that if he was a patentee he must either neglect his business to attend to his patent, or else he must neglect his patent. What he held was, that if a man was a patentee he must go to all parties connected with his trade, and tell them what his plans were, and make arrangements with them. Another hardship was for a man to find himself duped after he had made his arrangements with a patentee; but he was sorry to say that the present laws enabled persons to be victimised in that way. Above all, it must never be forgotten that times were changed, and that we were changed too, and that we were not consistent in maintaining patent laws, which only tended to restrain trade.

Admiral Sir Edward Belcher said the question of absolute invention, of the strain on the brain in bringing the first idea into satisfactory action, could only be comprehended by those men who had toiled, and dreamed, and expended time and money in perfecting an invention. Inventions which deserved the protection of patents should only be discussed by actual inventors. If it were assumed that the great men who had risen to eminence in their different pursuits, saw no bright light ahead which was destined to reward them for their labours, it was most probable that, counting the cost, the waste of time, and the ungenerous return which inventors experience from the public, they would at once exclaim, "Better far stick to my work with the tools I have than fool away my time that others may benefit by my exertions." Inventions, however, in many instances, were not the result of absolute study for a decided purpose; in some cases the result of mere accident. An instance of this had occurred to him without the slightest idea of seeking for or taking advantage of it. He was engaged in turning a very hard wood, which threw off very fine bright sulphur-coloured shavings and dust, and had invited a party to dine on board his ship. His steward warned him he had barely time to dress, and brought him hot water. It was near the equator, and the exertion of turning had produced profuse perspiration. He washed his face with the plain water and got rid of the fine dust. The moment he began to use the soap to his hands and nails they were immediately dyed of a bright red, and in that state he was compelled to receive his guests. That, however, was his secret; he had, *malgré lui*, discovered a dye. Now what was the effect of a discovery made under such circumstances? For the moment he followed it up, amused himself by dyeing flannel, cloth, &c., but his time was too valuable; he had other duties demanding his attention; it would not pay, and it passed unnoticed. So would it be with engineers and workmen—unless they saw the course open, by the protection afforded by patent, they would in a similar manner neglect discoveries of the utmost importance.

Mr. George Clarke said that when in a discussion of this kind men of such distinction as Mr. Hawes, the Chairman of the Council, Sir William Armstrong, and others who had evinced the highest talent and the soundest discrimination, expressed the views which they had, it became the duty of inventors and of the public, whose interests were really identical, to stand up in favour of protection to inventors. There had even been some hints in the legislature as to an intention to abolish the patent laws, and he thought it was, therefore, incumbent upon inventors to do their best to refute the hollow arguments by which it had been attempted to be shown that inventions should not have protection. Mr. Hawes said that protection by patents was detrimental to our own manufacturers, because it held out a premium to manufacturers abroad to reproduce our best productions. He confessed that he had read that observation with surprise, and he could not even now quite understand it. It was supposed that from a specification, foreigners could at once seize all the ideas of an original inventor, and be able to carry his plans out.

Unless that was the view taken, where was the danger to the interest of the country in publishing specifications. They all knew, however, the extreme difficulty of carrying out inventions. It was not always the original inventor who carried out the invention, but it was by the combination of his talents and the capital of others, which he was able to command by having secured a monopoly, that at last the public was presented with all the fruits of the invention. Surely the original inventor had the best chance of bringing his invention to bear, and he certainly thought that the danger to this country was very little of its trade being injured by foreigners taking up our new inventions. But now that free trade existed, supposing the result to ensue which was stated in the arguments of those who stood up for the public, then it would be to the benefit of the public if the foreign manufacturer should be more successful than the original inventor, in carrying the invention into practice. They all knew how difficult it was to seize the ideas of others from any written description. It was almost impossible to understand an invention without diagrams and drawings. He knew a case in his own experience in which, in order to introduce spinning machinery into Belgium, although the drawings and specifications were published, the foreigners were obliged to send a skilful workman over to England to engage himself in the manufactory. He saw no reason, therefore, on that ground, why patents should not be granted for inventions. Another point which had been referred to was the great number of patents which had been taken out, and the great loss, as it had been said, to the public. This fact, which had been put forward so prominently as an argument against the patent laws, and a condemnation of inventors, was, in his opinion, the highest proof of the great utility of protection, even in the shape in which the law now afforded it. He would not now enter into the present state of the law, which he admitted to be very defective, but what he was advocating was the existence of protection to inventors. It was nothing but the patent law which had brought forth this great number of patents. It was the hope of reward which had stimulated inventors, and which had induced men to become inventors when otherwise they would not have been so. That which happened in all other cases happened in this case; for after all the shape which a patent took was that of a commercial enterprise, and nothing more. They must evoke the spirit of competition, and if they did that then they would at once obtain those results which had raised this country to the pinnacle of greatness. The great merit of the existing patent law was that it stimulated inventors to compete for the great prizes which were only the rewards of success. They all knew, when they started in the race, that they could not all be successful, but this was the case in all professions and occupations. Therefore, this argument, which was used against protection to inventors, was really the strongest argument in its favour, for it was quite a mistake to suppose that the number of applications for patents represented the same number of real inventions. The number of patents worked in this country, in proportion to the population, was less than in Prussia. He had just been told that the number of patents granted there was only seventy per annum; but the system there was very exclusive, and the committee of experts refused any patent which they did not understand, and, therefore, the number was very much reduced.

Mr. Winkworth said that he had intended to enter, at some length perhaps, into the discussion, but his friend Mr. Hawes, in his admirable speech on Wednesday last, had so fully anticipated any arguments he could have adduced in support of the views they held in common on this subject, that he would content himself with a few words only. Having about ten years since, on the occasion of a paper on the patent laws read by Mr. Webster—distinguished like that with which he had favoured the Society at their last meeting, by acute reasoning, if not by conclusive arguments—taken a rather prominent part in the discussion, he could not reconcile it to himself to be quite silent that evening. Although in the debate to which he referred only one other member besides himself, Mr. Denison, advocated emancipation from the paralysing influence of these laws, it was spread over no less than three meetings. Either, therefore, the arguments they had advanced were very cogent, or those who adopted the views of Mr. Webster, being themselves inventors and too much dazzled by the prizes which they saw dangling before them, were too much interested in the retention of the law to see clearly that the statements they made of the hardships imposed on inventors by these laws, were precisely those which established their utter worthlessness. For his present purpose it was not necessary that he should affirm or deny that invention or discovery, when published, was property, but it must be borne in mind that such publication was voluntary and not compulsory. All that he argued was that in the interest of progress in art, science, and manufactures, even in the interest of humanity itself, these laws ought to be repealed. Since the time alluded to above, other and more important opponents of these laws had entered the field: it was sufficient for his purpose on the present occasion, though there were many others whom he might name did time permit, to refer to the late eminent engineer, Mr. Brunel, who, in the chair, when Mr. Hawes read a paper on "the Soap Manufacture," eagerly availed himself of the opportunity to confirm Mr. Hawes's complaint of the impediments to improvement which these laws presented at every turn, and to condemn them from dear-bought experience. In fact he denounced them in the most emphatic language, as having been a constant source of annoyance, difficulty, and loss, the full extent of which it would be difficult to exaggerate. In this he (Mr. Winkworth) fully concurred, and nothing had taken place since that time to alter his conviction that these laws were not susceptible of improvement, and so long as any similar enactments, professing as these did, to encourage invention, were suffered to continue in operation, the complaints so frequently repeated during this discussion in various forms, would be urged by the sufferers from them. He need scarcely add that the views he had long entertained were confirmed by the discussion, so far as it had gone.

Captain Selwyn, R.N., said, as a member of the Council of the Inventors' Institute, he felt it would not be well if the discussion were allowed to be closed without expressing the opinion of that body. They felt it to be their mission to protect the interests of inventors, and he was there to say distinctly, that although there might be defects in the present system, and although the laws might be very faulty, and the interests of inventors and the public might appear to be antagonistic, this was not really the case. The first question started by Mr. Webster was, whether inventions should be encouraged and inventors rewarded. No one could have attended the discussions which had taken place without seeing that the general sense of the meeting was to affirm this proposition. He did not see the good of having a board of experts, for his experience of boards had taught him that, if parties applied to boards, they were sure not to get anything done as long as there was any possibility of anything being staved off. He did, however, rely on one board, and that was the public. The public was the great body of experts who seldom or never made an error, and who gave a really practical decision on a patent by giving money for it, and in that way the inventor was very fitly and properly rewarded. But few of the inventions which were brought forward would ever be carried out successfully, if the whole energies of one individual were not devoted to that single object. There had been something said about injustice to the public and the manufacturer. The manufacturer was not obliged to buy an invention, and if he bought a patent and found himself taken in, he had no more right to complain than a man had who had bought a horse without a warranty, and then had found it to be unsound. If he

acted on his own judgment, without making proper investigation, he must not be surprised if he was duped. He thought they should never pull a brick out of any structure without they had a better one to put in, and in this case that had not been brought before them. Certainly it had not been brought forward at this meeting. He entirely denied the argument which had been used in connection with the copyright law, and he thought that the manufacturers had not spoken of inventors in the way in which they should, because it must be remembered that it was the inventors who had made the manufacturers what they were, and who had made our great nation what it was. But for them, mankind would now be in much the same condition as they were in the time of Adam. No doubt such men as Sir William Armstrong and Mr. Hawes were in positions which rendered them independent of the patent laws, but he could not conceive of any engineer, mechanic, or artizan, wishing to do away with such a stimulus to exertion and improvement.

Professor Wanklyn wished to correct a remark of one of the speakers, who said that patent laws existed throughout the whole of Europe. There was certainly one place where there was no patent law, and that was Switzerland, and, indeed, throughout a great portion of Germany there was virtually no patent law, for everything had to be patented some thirty or forty times before a patent became valid. According to this it would appear that there was at least one part of the civilised world where patent laws were in disrepute. He would just say one word as to why patent laws should be abolished. The justice due to inventors was often insisted upon, but why was it just to reward an inventor? Only as an example of this great principle—that it was just to reward individuals who conferred great benefits upon society, but who reaped no reward themselves. Now, was this practicable? Could we do this? He thought it was utterly impracticable. There were a great many people besides inventors who conferred immense benefits upon society, but who themselves reaped no rewards. If, then, there was no other argument for the law than that general principle, it must fall at once, because if once they admitted it, it would lead them too far. He would give a very common instance as an illustration. Everybody knew now a days of the immense improvements which had been made in the production of dyes. Dyes had been produced, as everybody knew, from coal tar. In the production of these dyes about a hundred people had been employed in order that this end might be produced. What did the patent law do? Why, it did not confer any reward upon any of those hundred people, but only just upon the last man, who appeared to put the last stone to the edifice which others had raised. Now was this just? Why should they single him out, and pass over all the others? The system was an unjust one, and he believed there was nothing in this country so unfavourable to science as the patent laws.

The Chairman said he thought the meeting would agree with him that the subject had now been sufficiently discussed, to make it right that he should ask them to do what he was sure it would be very gratifying to them to do, to express their thanks to the author of the paper, who would be afforded an opportunity of making observations in reply to some of the arguments which had been addressed to the various questions raised by his paper. He should like, however, with the permission of the meeting, to make a few observations upon the subject matter of discussion, before he conveyed their thanks to Mr. Webster for the paper which he had read. He thought it was very fortunate that the subject had been introduced by a man who had himself had so much personal experience in the working of the patent law, and who had had a large share in the framing the patent law of 1852, or at least in the combining of two bills into one Act of Parliament, and who since that time had had great experience of the working of the Act. He would not, however, consider the merits or demerits of the Act of 1852, which regulated the forms of procedure necessary for acquiring patent rights, but would limit himself to an inquiry into the claims of inventors to some public recognition. With the exception of one or two gentlemen, there had been but little disposition to deny the claims of men who had invented important improvements in manufactures to some kind of recognition. He thought the general objection had been rather to the form of recognition by means of the patent law. If it were fitting to reward intellectual results in the form of inventions, or of works of literature, or art, the question then arose whether the protection of inventors for a limited period of time was a reasonable character of reward. They knew that there had been in this country, and doubtless in others, some subjects for which the state had offered rewards, such, for instance, as the important discovery of the longitude at sea, for which a state grant was made to Harrison. Then again, there was the northwest passage, which the state thought of so much importance that its discoverer would be deserving of a large national reward, and although the state by these acts had recognised the right of reward for great services it was obvious that with regard to the greater number of inventions such a mode of reward was utterly inapplicable. It had been said, by some gentlemen who did not deny the right to a reward, that it would be better to give that reward out of some public fund. He thought, however, that the greater part of the meeting would adopt the views enunciated by Captain Selwyn, that, however desirable a public board might be to decide as to the novelty of any particular invention, the public were after all the best judges. No public department could successfully accomplish the desired object, so that they were brought back to the system already adopted in this and other countries. It seemed to be considered that whether in connection with literature, science, art, or invention, protection of the inventor was the most convenient, the justest, and the best reward which could be bestowed upon him. All that was done was that, for a limited time, he was allowed the use of his invention before the general public could have the benefit of it. He could not himself see what injustice there was to the public in that. He would refer them to the statute of James I., and ask them if the words of the statute could be improved; and when it was said that this law was a relic of the olden time, it must not be forgotten that America adopted the principle of it in 1790; and that in 1791, at a time when privileges were not very much upheld in France, it was also adopted by that country, and since that time the same principle had been introduced into other countries. The words of the statute, which was for awarding monopolies were, that it should not extend to letters patent for the term of fourteen years for the sale, working, and making of new manufactures, which shall be "neither unjust, mischievous to the state, nor hurtful to trade, nor generally inconvenient." Could there be a better definition of what the public should reward than that? Something had been said about the patent law being injurious to free trade, but it seemed to be forgotten that all the greatest political economists of our country were in its favour, Adam Smith, Bentham, and John Stuart Mill; and, therefore, when gentlemen talked about its being in opposition to free trade, and looked upon those who supported it as being still in ignorance of sound economical principles, they might be fairly answered that opinions coming from such men as he had just mentioned were at least worth consideration. He would also ask those gentlemen to remember that all the existing laws of copyright had been passed in the present reign, and that only two years ago this very Society, by its own laborious efforts, succeeded in getting an act passed for giving artists a copyright in their works, so that this species of protection was not such antiquated legislation as some people described it to be. Then it was said that the present system was unjust to inventors; but he would rather let the inventors determine that

question for themselves, and they certainly seemed to be satisfied with the principle of the protection afforded to them, and to desire to preserve it. The gentleman who spoke last had complained that under the present system, one was rewarded while another was not, but he was very much afraid that that would be found to be the case in all things in this life. Then the question remained whether it was an injustice to the public that an invention upon which a very large amount of time, and labour, and capital, had been expended should be preserved to the use of the inventor for a certain time before the public had the benefit of it. It certainly seemed to him that to defer for a time the enjoyment by the public of the fruits of intellectual labour, employed in important experiments, producing discoveries of much value, was not unjust to the public, and did not obstruct economical progress, and this plan possessed the recommendation of graduating the reward by the extent to which the invention was usefully employed. He would only add that the wondrous extension of our manufactures and commerce during the last ten years would seem to show that, whatever other effects might have resulted from the law of patents, it had not hindered the growth of national wealth. He would now, in the name of the meeting, express to Mr. Webster their warmest thanks for the able paper which he had read, a paper which was exceedingly moderate in its tone, and which had therefore brought the subject before them in the best form for consideration.

Mr. Webster said he felt very thankful to the meeting for the way in which they had received the chairman's proposal of a vote of thanks to him, and he would take the opportunity which was now afforded him of making a few observations on some of the points which had been raised in the discussion. He would say at the outset that he really felt very great satisfaction in bringing this subject before the Society after a long interval. It was now some twenty years since it was first brought under the attention of the Society, and he believed that much good would result from the discussion which had just taken place. The discussion was certainly a very exhaustive one, and there was hardly a single point which had not been raised. There was no doubt at all that there were very great inconveniences in the present patent law system, and the cost of litigation itself in connection with it was a scandal to the country, though he admitted that this was a matter with which a strong hand could deal. He would not go into detail on legal matters, but there was one point to which he would just refer, and that was that it had been decided that the user of a machine under any circumstances might be liable. That decision, however, had been doubted by a very great authority, and he thought that it was a matter which ought to receive very serious consideration. There was also another question, as to how far a person who was merely the possessor of a patent ought to have the privileges of a patent law extended to him. They all knew how the matter had been dealt with by the present Lord Chancellor; but these were questions which deserved the greatest attention, and if the suggestions which had been made during the discussion were carried out, it would certainly be a step in the right direction. He could only repeat what he had said before, that he did not believe it was expedient to grant patent right as a matter of course. Lord Stanley, in a discussion which was held some years ago, stated that he conceived the only patent right was a right to bring an action, which right should not be granted as a matter of course, and if this were more borne in mind, much of the present opprobrium would be removed. With regard to the appointment of a tribunal for adjusting the rights of the public and of the inventor, there was no doubt that it was a matter of extreme difficulty, and he thought that Sir Edward Belcher and Captain Selwyn had really disposed of that question, and he himself believed that it was impossible for any board of experts to value an invention, which was a matter to be left to the public alone, and then, after the public had valued it, they would find men coming forward to purchase it at its value. He was very glad indeed to see their old friend Mr. Macfie, who had been for so many years a staunch opponent of the present system, though not of the rights of inventors, because he must do him the justice to say that, although he had spoken very strongly on the subject, he had yet always been the consistent advocate of licenses. With regard to what Mr. Winkworth had observed about what Mr. Brunel had said as to the soap trade, he only wished that Mr. Brunel were present, and then he would have asked him which he had found to be the greatest obstruction to the soap trade, the excise or the patent laws. There, in the excise, they had an instance of the most scandalous abuse in restricting invention. It was almost blotted from the statute book, and he hoped that it would soon be abolished altogether. Another topic of some importance had been referred to by some of the speakers, one of whom had asked whether, in order to prevent the taking out of a patent by some one else, he was to advertise his invention in the newspapers. No, certainly not; but he could do this:—on the payment of a small fee (and he wished it were less) he could record his invention at the Patent Office in the shape of a provisional specification. That was one of the objects of the new patent law, to provide a means of recording inventions. It was no doubt a very great hardship for a man to make an invention and after a time to abandon it, and then find afterwards that somebody else had taken out a patent for the same thing, and that he could not use his own invention without being put to a great deal of trouble and expense in litigation. It must be remembered, however, that the patent law did not so much reward the inventor because he was an inventor, but the man who gave the public the benefit of the invention; and this was recognised in the fact that patents were granted to the importers of inventions, the policy of which entirely rested upon this principle, that this was for the good of the public, and for that reason the man was rewarded, and not for being the successful inventor. If the matter was looked at in this view, it would be seen that it was out of regard to the public benefit that the reward was given. Professor Wanklyn seemed to conclude that, because science was not rewarded as it ought to be, therefore the practical arts, as developed in inventions, ought not to be rewarded, but that certainly was no valid argument against the system. He wished the meeting particularly to bear in mind the distinction which he had pointed out the other evening between an inventor and a discoverer, and he utterly denied that there was any analogy between the cases at all. With regard to preliminary examinations, there was a great difficulty in knowing what one single step might lead to, as an inventor was very often before his age. He had referred, in his paper, to the fallacies into which some persons fell, in connection with this subject, and he thought that Mr. Hastings had fallen into an entire fallacy in what he had said about territorial grants, because the fact was that it was altogether a false analogy. In the matter of discovering a new country it was entirely a question of first occupancy, which was the basis of all holding of property; that was merely discovering what was in existence before; but in a patent a thing was created which did not before exist, and for that a reward was given. An allusion had been made to Dobbs's case, and he was glad to have an opportunity of mentioning it, because he thought it was an illustration of the advantage that would have resulted from a preliminary inquiry, inasmuch as if such an inquiry had taken place all the litigation would have been avoided. If a preliminary inquiry were held at an early stage the inventor would not have to go on blindfolded, as he did now, but if he went on after he knew the real state of the case it would be on his own responsibility. With regard to the annual payments, there might be difficulties in the way, but the periodical payments had been very serviceable, and he had

no doubt that yearly payments would be found to be the same. He had only one other thing to mention, and that was with respect to the screw-propeller, which, but for the patent laws, never would have been started. The Archimedean Company established it under the operation of the patent laws, and hence its success. With these observations he would again thank the meeting for the manner in which they had entered into the subject, and he hoped that much good would result from the discussion.

Mr. Henry Cole, C.B., writes to the Secretary as follows:—

At the adjourned meeting of the Society to discuss the Patent Laws, I request that you will have the kindness to read this letter as a substitute for my presence. I feel it somewhat of a duty not to be silent, having taken an active part years ago in promoting the reform of the Patent Laws upon the principles sanctioned by a Committee of the Society, whose three published reports I was entrusted to prepare.

1. In 1849 a numerous Committee of noblemen and gentlemen* was appointed by the Society to promote "Legislative Recognition of the Rights of Inventors." The opening paragraph of the first report of that Committee was as follows:—

"1. A British subject has no rights of property whatever in that intellectual labour which produces invention or scientific discovery, excepting such as he can obtain by petition from the Crown. He may have bestowed years of mental exertion and manual toil in perfecting a discovery most beneficial to mankind, still he is not in the position of being able to claim even the recognition of the fruits of his labour as his own. He must become a petitioner for the right to the Crown, which is absolute and irresponsible, and may refuse it without any power whatever of appeal. Many and well-settled as are the rights of British subjects compared with those of other nations, the suppliant inventor has no rights of his own in his invention.† The inventor in France, in America, in Holland, and in Belgium, even in Austria and Spain, has his rights recognised by declared law; but the Englishman has none. By passing through a series of formulas, so antiquated that the origin of them is lost in the obscurity of past centuries—so empty and frivolous, that common sense revolts at them—so numerous that they can hardly be reckoned accurately—so intricate, that every one seems a pitfall to discourage scientific invention to the utmost—so inexplicable, that the greatest diversity of opinion obtains in interpreting them—so costly, as to place scientific intelligence wholly within the power of capital; an inventor may at last obtain a mere recognition of his right, which he is then at liberty to protect as he may be best able."

2. This Committee brought before the public, for the first time, a recital of the thirty-five stages which it was necessary, at a cost of about £100 in fees only for England, to pass through to obtain a patent; and Mr. Charles Dickens, in a most humorous paper, entitled "A Poor Man's Tale of a Patent," in his *Household Words*, described how one Thomas Joy had perfected a model, and wanted to patent it; came to London; petitioned Queen Victoria; declared before a Master of Chancery; went to the Home Office; got his petition signed by the Home Secretary; took it to the Attorney-General; paid four pound four; "Nobody all through ever thankful for their money, but all uncivil;" back to Home-office; got a warrant; sent to the Queen; Queen sent warrant back; Home Secretary signed again; went to Patent-office for a "Draft of the Queen's Bill" and a "Docket of the Bill;" two copies engrossed, one for Signet-office, one for Privy Seal-office; engrossing, stamping; again to Attorney-General; again to Home-office; again to the Queen; then to the Signet office; then to Lord Chancellor; then to Privy Seal; then to Clerk of Patents; then fees to Lord Chancellor's Purse-bearer and to Clerk of Hanaper, and to Deputy Clerk of Hanaper; again fees to Lord Chancellor; and lastly, fees to Deputy Sealer and Deputy Chaff Wax! Pleasant processes to numerous interests—law and others. All this rubbish the Society cleared away.

3. The Great Exhibition of 1851 gave a great blow to this antiquated system, and a special Act of Parliament was obtained which enabled inventors to exhibit without the intervention of Hanapers and Chaffwaxes. Then a Committee of inquiry in the Lords sat, and an Act was passed, based upon many of the most important principles advocated by the Society, and in accordance with the practice more or less adopted by other European countries and the United States. I need not describe them; they are stated in the third report of this committee.

4. There has now been ten years' experience of this Act, and everybody, without exception, advocates the amendment* of the system; as Mr. R. Wilson said in his excel-

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* The Committee consisted of the following:—The Marquis of Northampton, the Earl of Radnor, Sir John P. Boileau, Bart., Sir J. J. Guest, Bart., M.P., the Right Hon. T. Milner Gibson, M.P., Henry T. Hope, Esq., M.P., Samuel M. Peto, Esq., M.P., Sir James Anderson, Glasgow, George Brace, Esq., Henry Cole, Esq., Charles Dickens, Esq., J. H. Elliott, Esq., John Farey, Esq., C.E., P. Le Neve Foster, Esq., M.A., Charles Fox, Esq., C.E., Wyndham Harding, Esq., C.E., Edward Highton, Esq., Capt. Boscawen Ibbetson, K.R.E., Owen Jones, Esq., Herbert Minton, Esq., the Potteries, R. S. Newall, Esq., Gateshead, Dr. Lyon Playfair, F.R.S., Richard Prosser, Esq., Birmingham, Dr. J. Forbes Royle, F.R.S., W. W. Rundell, Esq., Falmouth, Archibald Slate, Esq., Woodside, Dudley, J. Jobson Smith, Esq., Sheffield, Professor Edward Solly, F.R.S., Robert Sutcliffe, Esq., Idle, Leeds, John Sylvester, Esq., Arthur Symonds, Esq., Professor Bennet Woodcroft. Secretary—George Grove, Esq.

† "There is not any clause or enactment by which the subject can demand them as a right. This great encouragement to industry, this fruitful source of wealth, is still the free gift of the Sovereign. It emanated from Her Majesty, as the patron of the arts and sciences, at the humble request of her subjects; and it is as a gracious favour that she extends this royal protection to the inventor."—*Godson on Patents*, p. 21."

* The following were the heads of a Bill recommended by the Society in 1852, and it will be seen that many of the evils now complained of would not have existed had the recommendations been fully adopted.

RESOLUTIONS PASSED TO FORM THE HEADS OF A BILL.

1. That everything in respect of which a patent may now be granted should be registered.
2. That the benefits afforded by Registration should extend to the United Kingdom of Great Britain and Ireland, and the Channel Islands.
3. That the Registration should be considered merely a record of claims, and not as any determination of rights betweeen parties.
4. That it should be competent to any Inventor to make disclaimers and to rectify errors in his Specification at any period.
5. That Registration of Inventions should be obtainable for a period of one year on payment of £5, and should be renewable for four periods of five years each, on payment of £10 at first renewal; of £20 at second renewal; of £50 at third renewal; and of £100 at fourth renewal. [The principle of renewed payments is proposed as a means of testing whether an invention is in use, and of removing useless inventive rights that might otherwise be obstructive of improvements.]
6. That there should be penalties for using the title of "patent" or "registration" where none has ever existed.
7. That the present tribunals are insufficient for the trial of subjects of design and invention.
8. That it should be permitted to commence actions for infringement of the rights of Inventors in the County Courts.
9. That inasmuch as, contrary to expectation, very little litigation has been created by the rights conferred by the Designs Act of 1842 and 1843, this committee is of opinion that a fair trial should be given to the working of the proposed system of Registration of Inventions before any special tribunal to determine inventive rights is substituted for the existing tribunals.
10. That any tribunal before which proceedings are commenced should have power to refer any case for report and certificate to the Registrar, assisted by competent and scientific persons.

lent and practical speech, "Either improve this system or give up the patents altogether," whilst there is a strong and growing party which desires its repeal and the abolition of patents. A commission, consisting of legislators, lawyers, and others, are investigating what is to be done, and, appropriately enough, the Society again discusses the subject.

5. Certainly the problem is most difficult, and not to be hastily solved. It is easy, if you are convinced, to say, "Away with all patents, and no monopolies; leave manufactures alone and to manage for themselves;" and I confess I find myself inclining more in that direction than towards tinkering at minute administrative legal details.

6. Yet, on the question of principle of patents, I hesitate to say confidently that Adam Smith and Bentham, John Mill and others are in error, and that the practice of other countries is wrong. But the discussions which have taken and are taking place, as well as the experience of the last ten years, make, to my mind, some things in this matter quite clear. I have no interest whatever in any patent. I claim to have been a reformer of the old patent laws. I am not a patent agent or a lawyer, and I think I am quite unprejudiced and dispassionate on this subject.

7. It is clear to me that copyright in authorship or artists' work is quite distinct from patent right in invention, or the "first finding" of a thing. Minds, however alike, dwelling on the same thoughts, could never utter them or represent them in the same way identically. Mr. Webster says, "the subject of copyright is one specific combination of words, letters, and lines, in this respect similar or analogous to the specific combination constituting a machine. The fallacy of this is apparent when we put Shakespeare and his "Hamlet" as "similar or analogous" to W. E. G. and his "Ærial machine," or R. D. and his "Hair brushes rotatory," or W. C.'s "Lubricating apparatus," as registered in the Society's last *Journal*. But inventors seeking to find a something would most probably each one find that identical something at the end of their race. They are like huntsmen—Reynard is there—somewhere—and the first seizes the brush, which the second or third might have got by happy accident.

8. It has been hitherto held to be good public policy that the first finder shall have a limited monopoly of his invention against other seekers and finders, on condition of his honestly making it fully public.

9. Everybody agrees that the finder does all he can not to keep this part of his engagement. His specification is made as dark as possible. Can you compel him to make it clear and definite? Perhaps so, but it is difficult. Perhaps a public registrar might usefully be appointed to determine if the inventor did or did not state in a given form, clearly and unmistakably, what his invention was?

10. I am opposed to Mr. Webster's opinion that "Patents should *not* be granted as of course, but some check be placed on their indiscriminate issue by a preliminary inquiry and report." I don't wish to see a Pope for patents, or any compulsory tribunal attempting to decide if the invention be one or not. I doubt its competency and authority. I am sure it would give little satisfaction, and certainly an appeal against its decision would have to be allowed, which might be good for lawyers, but certainly not for inventors. The onus of the proof of the invention I think must rest solely with the inventor. Like all other possessors of rights, the inventor himself must defend his own if he care for it.

11. One great merit of the existing law is that it extinguishes frivolities. Mr. Hawes has shown that out of 3,000 patents, only 100 sought to exist for seven years. "Only 100 out of 3,000 are worth £100 at the end of two years."

12. If it be determined to maintain the principle of a Patent Law, then the preservation of this principle of successive stages seems to me most important, but I think the time of duration of the right as well as the cost should be greatly reduced.

13. Let the "first finder" or inventor have a right of registering that he claims to be so. Compel him to register his claim as distinctly as possible. Allow of no evasions. Pay a public officer to keep him up to the mark. Allow his claim to stand good for twelve months and no longer. This period, I think, would be sufficient to enable him, not, perhaps, in some few cases, to *perfect* his invention, but to keep a-head in the market of other claimants, and to find, if necessary, the capital to go on with it; for it is generally admitted that the first finder has to find, besides his invention, the capitalist, who works the thing found. As Dr. Collyer said—"Men who had money did not, as a rule, devote themselves to invention."

14. It may be said that so short a period of monopoly is not long enough to attract capital. I don't believe it. Capital will obey the usual laws of self-interest, and it is not requisite that Parliament should give it monopolies or protection. It can take care of itself.

15. It has been proved, I think, that no very great discoveries can be traced to the monopoly granted by the Patent Laws. They go on quite independently of charters or legislative laws and such like artificial conventions. I have arrived at the belief that the progress of inventions, either great or little, would not be arrested in the slightest degree if Patent Laws were abolished. Philosophers don't want the monopoly. Competitors for "first findings" may—and it may be right to give it, although it is admitted that the monopolies granted lead incidentally to great nuisances, undoubtedly hindering other competitors.

16. The question resolves itself to this. Is it right public policy to encourage first finders or inventors to hunt for things? to register publicly such findings, and, in return for such public registration, to acknowledge their claims to a right to the "first find" for a very limited time? and I come to the conclusion that under present circumstances it is. Such policy may lead to the abolition of even the very limited monopoly proposed. If it do, it will be an easy transition—better, I conceive, than a violent and absolute revolution, like the total abolition of patents. If it do not, then the limited monopoly will remain, in accordance with public convictions of its public utility, but very limited in duration. The right of monopoly should, I think, be obtained easily, and at a cost sufficient and no more to pay the expenses of a proper registration. Experience has shown that the present fees are merely a tax, which has not even yet been applied to erecting a creditable Patent Library or Museum for Inventions, things of great value and public interest apart from the policy of patents.

Mr. W. Bridges Adams writes:—

A strong effort is now making, by a small but energetic body of persons, against the continuance of the patent

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11. That upon the illegality of the Registration being established by the judgment or order of any competent tribunal, the Registration be cancelled.

12. That there should be only one office for the transaction of business connected with the Registration of Inventions, and the payment of fees in respect thereof.

13. That every person desiring to register an Invention should submit two copies of the Specification of his claim, accompanied, in every case where it is possible, by descriptive drawings.

14. That the mode and procedure of Registration should be regulated by the Board of Trade, subject to a report to Parliament.

15. That an annual report of all Specifications registered, with proper indices and calendars, should be laid before Parliament.

16. That a collection of all the Specifications should be made, calendared, and indexed, and deposited for public information in the British Museum.

17. That it is highly desirable that such a collection should be printed and published.

18. That the surplus profits, after paying office expenses and compensation, should be directly applied to some public purpose connected with invention, but not carried to the Consolidated Fund.

laws, on the ground that they are injurious to the general interests of the community. Could they make out their case it would be quite right that the laws should be abolished, for the interests of a small body of persons, such as inventors, must give way to the general interest. It has been long conceded that individual property in matter is a general advantage, much more so than possessing matter in common. It could not be tolerated that large estates should be the property of individual owners save by the conviction that this ownership produces on the whole a larger usufruct for the general benefit. Nor would the owners of these estates portion them out in farms of greater or less size save from the conviction that by individual skill and possession they reap a larger rent. Were it not so the land would be all in common and uninclosed. Every man in the community seeks as far as he can to obtain a monopoly of all the things he desires, and so the landlord has a monopoly of his estate, and in the farmer of his farm, and in the miner of his mine, and in the millowner of his mill, and so on through all the various conditions of propertied life. But that which gives the highest value to matter is mental ideality. Without this we should be mere clods—of the earth, earthy. Our talk would be of beeves, and we should scratch the earth's surface skin deep, as most half-savages do, to get a scanty crop of grain and roots. To make mental ideality fructify and constitute public utility, we must do by it as we do by matter, give it individual ownership and enclosures, not mock but real. For though it is quite true that even as unenclosed land will produce a wild crop, so will unenclosed mentality, but the value will be in the same proportion that rye grass bears to wheat of the highest standard. Men of mark and cultivation, and consecutive mental industry, will not sow that others may reap the harvest. They will either keep their ideas concealed, or they will set their investigating faculties at work to ascertain why, if the ideas of the brain are to be made common property, matter also should not fall into the same category? It is quite clear that the inventor has no inherent right in his invention beyond keeping it a secret, and that he can only turn it to his own profitable account by the agency of the community, who are to use it directly or indirectly, for if there were no community his invention would be valueless. His advantage and that of the public must advance with equal steps, and it is for the public who grant the right to consider whether, upon the whole, it is not more for their interest to protect and help these inventors than to thwart and starve them. Inventors proper are not numerous; even the patentee list—and far be it from us to assert that all patentees are inventors—the patentee list falls far short of the booksellers' list of large and small poets and rhymesters inclusive. They rank with, and are a part of, the original-minded men who have the perception of truth and beauty and analogy in all things—thought, language, sound, form, colour, and structure. In virtue of their instinctive and not mere imitative properties, they are men of genius who direct their fellows into new tracks, and constitute the great distinction between the English nation and the Chinese. Poets, book-writers, painters, sculptors, musicians, chemists, and constructors, all fall into the same category, and are all represented by matter, and the nation may, if it chooses, deprive them of the right of property in their own creations. The poet and bookwriter gather their royalties from the manufacturers of books, or may print themselves exclusively. The painters and sculptors gather royalties from the multiplication of their works in casts and engravings. Musicians gather royalties on the sale of their measured notes represented in print, and there is no more justice or policy in shutting out the constructor and chemist from their royalties or their originalities, than there would be in throwing open the writings of Kingsley, Dickens, or Tennyson, to the voluntary contributions of Paternoster-row. We do not wish to use the *argumentum ad hominem*, but, nevertheless, we cannot accept the arguments of interested men against patent laws, which act as a curb on their desires to possess a capitalist monopoly. They profess a desire to see inventors rewarded without patents, but they do not tell us how this is to be done. Is to be by Parliamentary grant? How then is the inventor to be defined if there is no record of his invention, no making it patent? Is he to enter into a squabbling and canvassing contest with loud-tongued, unscrupulous pirates, and canvas the members for their votes? This would be to make it a matter of politics, like a contested election, in which the retiring student would have no chance against the brazen and unscrupulous man of action. But, say the opponents of patents, there is an injustice in giving an exclusive privilege to a man to-day for that which another man might invent to-morrow, or next day, or a month after. Similarly so might it be said, that it is an injustice for a duke to possess an estate which might next day or week have become the property of an earl had he not been forestalled; or, that it is an injustice for England to possess New Holland, which might otherwise have become a possession of France. We cannot see the injustice that a man who is up and doing should take possession of that which had before his time no owner, and is in fact a creation, or pro-creation of his own. There has been much talk about the absurdity of many patents, and how few of them are of any value, while they are obstructive to inventors, and that it is necessary to sift them by a preliminary examination? Do people really understand what this means — that a man's secret—his invention—shall be canvassed and discussed, and the patent given or withheld at the option of the examiners? Is it possible to remove from a sanguine man's mind the idea that some wrong motive has been at work, that nepotism has refused to him what will be granted to some friend of an examiner. Warn the man, if it be needful, but give him his patent if he persists, and after he has specified, put it on trial, in full court, and expunge it from the records for sufficient reason. The man will then have justice, and the patent lists will not be damaged. Assuming that patents are useful to the public, as tending to make men work earnestly and consecutively at new things, it becomes necessary to ask what should be a good and fitting subject for a patent, and what not. What is novelty? It is an old saying that "there is nothing new under the sun." As regards the public everything is new that has not been in use for a generation, and the fact that a thing has been recorded without being used should not invalidate an inventor from turning it into use under the protection of a patent. If a thing has disappeared from public use for the space of thirty years it would be a positive advantage to the pubiic that an inventor should have a patent—a mental enclosure—to induce him to foster it and give it a new birth. Still the outcry is of "monopoly," the cuckoo cry of free trade, as though there were any opponents of monopoly so strenuous as the inventive men, as though the whole world would not be a monopoly save for these beaters down of the old ways. The true monopolist is the capitalist, and man in possession by virtue of his position. He may allege that he is open to competition, but this openness is only in the sense that the doors of the London Tavern are open to all customers who have money in their purses. In competition the race is to the rich, and the poor competitor is hustled off the ground. Let an inventor without a patent bring to bear any improved article in large demand, he will infallibly be competed with, and displaced by, the larger capitalist, whose small profit on a large return will leave no profit at all to the man of small return, who, perchance, has expended all his means in perfecting the new article. But if he be protected by a patent, the inventor can hold his own till he himself become a capitalist too strong to be damaged, unless ruined by processes on the part of the capitalist, owing to the defective state of the law. It is the inventor who breaks down the would-be monopolies of capital; and other competing inventors, also, in their turn, break down the monopoly of the first inventor. They do not debar the capitalist from his rights to com-

pete in his accustomed fashion, but only to compete in the inventors' brains and new uses. Many prominent persons there are whose opposition to patentees is grounded on a case of defeated piracy, or in a desire to prevent all others but themselves from rising to eminence. This patent record and protection is the only fulcrum by which the inventive non-capitalist can lift himself to a level with the capitalist manufacturer, and disturb the stagnation which would else prevail. The competition of manufacturers is for quantity, not for quality. The inventors generally cheapen as well as improve—they substitute machines for human drudges, with far better results in quality. To attempt to reward inventors by grants is the merest moonshine. The reward would never get to the true inventors, but would be intercepted by the jobber; for the student qualities that constitute an inventor are not the qualities that canvas the attention of governments or government authorities. Even were it not so, how is the money value of an invention to be estimated? Only by its pecuniary success, giving an exclusive right to the owner, for a longer or shorter period, to manufacture or use himself, or to licence others so to do. But there is another argument used by the manufacturers which has a groundwork of reason; they allege that they can compete, on favourable terms, with all the world in manufactures, but that a patent in England, when there are no patents on the Continent for the same thing, puts them at a disadvantage with the foreigner. For example, the rise in price, and, probably, in profit, on English iron, enables Belgian iron masters to compete in the market of the world, subject always to the condition that the English iron-masters can underbid them if very troublesome. But, if upon any article, rails, or others, there be a patent right in England and none in Belgium, they must remain at a disadvantage. What does this amount to? That they seek to monopolise the iron manufacture, and, therefore, they should establish themselves in Belgium or they should take the Continental patents for the invention, and so guard themselves. Anyhow, we do not see why their interest should be studied in preference to that of the inventor if they do not choose to help themselves by helping him. "But the patent law," say they, in a sudden accession of care for the interests of the inventor, "is a mockery, a delusion, and a snare to the inventor; so let us abolish the law." We may paraphrase it thus—"The law of freehold in land is a mockery, a delusion, and a snare for the landholder, for it exposes him to be ruined in Chancery; therefore, let us abolish the law of freehold." I think that it is far better in the interest of the public to amend the law, and I would do it after the following fashion:—1. I would define novelty to consist in the fact that the thing patented had not been in use in England for a term of thirty years previous to the application. 2. I would have an applicant warned by the proper authorities that his application was for an invalid thing, but give him time nevertheless to record and and specify, on the ground that no examiners should be entrusted with a power to refuse an application for reasons which might be insufficient or possibly interested. But as soon as the specifications were lodged, it should be put on trial in open court at the cost of the community, and erased from the records for good and sufficient reasons, removing a stumbling block, or expunging any part of it required. 3. That all new and original things in a patent for any specific invention should convey a right to their use in every manner, *i.e.*, a new thing specified in an improvement for one machine should be applicable to every variety of machine, and an inventor should not be obliged to take two several patents for a gun and shot, or for wheels and rails. 4. That the patent should be renewable as a matter of course if the inventor, from no fault of his own, but from difficulty of introducing it, had failed to realise a certain rate of profit to be determined on. 5. That all trials as to patent validity, constituting it a property or otherwise, should be before an especial patent court, whose favourable verdict should be essential to patentee litigants before going into a court of law to obtain damages. We do not think that the tendency of disinterested public opinion is against patents, but the contrary. The chief opponents are those who wish capital to be individual property and brains common stock. The patent is the trade mark of the inventor, and if that be taken from him we trust that the trade marks of the manufacturers will be thrown open at the same time, for these trade marks, earned by long and hard work, are as much a monopoly in the market as the patent earned by the long and hard work of the inventor, for if one trade mark may compete with another, so also may one patent compete with another. We should like to know of what kind is the reward proposed by Mr. Hawes for inventors? On him has descended the mantle of his relative, the late Mr. Brunel, and it is upon the records of the committee of the House of Commons that Mr. Brunel's idea was that all inventions were made by workmen, and that a good master would reward them well,—one pound sterling for an ordinary invention, and five pounds sterling for something extra good. Mr. Hawes's definition of the distinction between copyright and patent right is hardly logical. What does copyright mean but the exclusive right to manufacture a particular book, and what does the patent right mean but the exclusive right to manufacture something else—the book originating in one brain and the something else in another. Invention is essentially forethought—a grapple with the future. Contrivance is afterthought—a patch upon the present, but the contrivance coming into an existing market is always better paid than the invention, and the inventor is frequently sneered at as being before his time. But for all that, it is the inventor who changes the face of the universe for the better, and lessens the drudgery of humanity, and adds to its resources and pleasures, while the capitalist and contriver reap the profits. It will be an evil day for the world if ever the counsels of Achitophel shall prevail to the starvation of originators. Nor do we see the justice of compelling the inventor to licence his rivals who may be interested in damaging his plans by bad workmanship, and over whose dealings he can have no satisfactory control. Some years back there was a humorous illustration of this practice. An umbrella maker advertised "the best silk umbrellas from 7s. 6d. upwards," and then added, with a vindictive animus against Sangster, from whom he had been compelled to take a licence, "N.B. A parcel of ugly alpacas on hand." Meanwhile the clear brain of the Lord Chancellor is getting in the thin end of the wedge, and his efforts will, doubtless, culminate in an Inventors' Court of Equity, for the legalisation of mental title deeds, at the cost of the Accumulated Patent Fund.

Mr. Edmund Hunt writes:—

Referring to the discussion on the 20th inst., I think it is a pity that, in order to avoid confusion, separate occasions were not chosen for dealing with the two great sections of the subject:—The question whether legal protection of inventions should be retained or abolished? and the question, whether the existing patent laws could be improved, and how? As to the first, I would ask whether protection should be retained from principle or from expediency? I think the only sound arguments in its favour are those grounded on expediency; and if so, what may be expedient now may not be so ten years hence. Ten years ago I was enthusiastically in favour of patents but unusually good opportunities for studying the subject, and for general observation thereon, have brought me gradually round to the firm conviction that the time is not far off when it will be better, both for the inventor and for the public, for patents to be abolished. But I must by no means be ranked with certain recent agitators against the patent laws, for I believe the very injudicious and faulty character of their arguments will have the practical effect rather of retarding than of hastening the abolition of patents. I do not, however, think that patents

will be abolished at present, and it would therefore be a waste of time to enter very fully into this branch of the subject. And although I hold opinions against the future expediency of patents, I do not suppose I am, on that account, the less likely to have sound views as to the practical defects of the existing laws and their remedy. As to definitions, which, as was truly observed, are of great importance in a discussion of this kind, I would call that a non-patentable discovery in which we find out how two things have been combined, or have acted on each other; and that a patentable *invention* in which we combine or make to act together two things which, as far as we are aware, never before were so combined or made to act. In the strict sense of the terms the human mind is utterly incapable of creating or originating even ideas. It receives its materials from without, and simply re-arranges them, and that not after any new plan, but in more or less close imitation of arrangements it has seen. A great many frivolous remarks are often made in discussions of this kind, about patents for frivolous things. If the things referred to are really frivolous, how can the public possibly suffer from their being patented, seeing that no one is bound to buy or use a thing because it is patented, and that no one will buy or use a thing that is, in his opinion, frivolous? The patentee is the sole loser, namely, of his time and trouble, and of the cost of his patent; but it is useless to tell him it is frivolous—he knows better. Obviously the moment anything becomes useful and is wanted, it ceases to be frivolous. All plans for dealing with the merit or value of inventions, in anticipation of their use, are utterly impracticable. I also consider it impossible for a board of examiners to deal satisfactorily, in all cases, with the question of novelty. The American system has not worked satisfactorily. But it is certainly not right that when an inventor pays Government for documents ostensibly giving him a certain protection, his payment should be received as for a *bonâ fide* protection, when there exists in the government office the means of knowing that, in many cases, it is worthless, from protection having been previously granted for the same thing. It is like obtaining money under false pretences. The remedy is, in my opinion, to employ a staff of examiners and searchers, who, as soon as possible after the receipt of every application for a patent, with a description of the invention, shall compare the same with existing patents and other records, and shall draw up a report, stating in what cases the invention appears to have been in any way anticipated or even approached. This report should be delivered to the applicant, and it should be left to himself whether to complete his patent or not; whilst, to prevent parties from imposing on the public by completing their patents, in the case of the inventions being old, and in face of the reports to that effect, such reports should be accessible to the public, and be printed along with the specifications. Surely a patentee is entitled to receive for his freely-paid fees a return such as the information contained in the report would be. In this plan I thus propose to adopt the good features of the American system, without the faulty feature of the arbitrary power of refusing a patent. But I believe that what would be found in practice to be the most advantageous alteration the present Patent Laws are capable of, would be to enact that the public use of an invention by the inventor or in imitation of him, for a period previous to his applying for his patent, should not invalidate such patent. In our own Indian Patent Laws twelve months are allowed, and in the American laws two years; and in America this provision has proved itself to be most valuable. At present in this country patents are taken out for a great number of things which prove impracticable or useless, but which, if the suggested alteration were made, would have been tried before it became necessary to apply for a patent. On the other hand, a great number of valuable improvements are continually being made without patents being thought of at the time, and afterwards when practical and recognised success suggests a patent, the inventor finds his publication of the improvement has debarred him from getting a valid one. With the alteration suggested, patents for such really valuable improvements would take the place in the lists of the class of useless ones previously referred to. The difficulty about compulsory licences arises from inherent defects inseparable from any patent system. Although, in consequence of existing prevalent ideas, but which have been fictitiously induced, a patent holds out a certain amount of encouragement to an inventor, it is still certain that it is often obstructive to improvement. Mr. Webster's challenge to cite cases of obstruction is ingenious; but numerous examples could easily be detailed; in fact, the larger portion of patent trials for infringement are due to it. The encouragement patents afford is measured out in doses not to be exceeded; and progress must take a stride only once every fourteen years! But it is said compulsory licences would obviate the obstructiveness of patents. They might, and have other advantages also, if a satisfactory system could be suggested. Has a practical system of compulsory licences ever been suggested? I think not. It would obviously not do for patentees to fix their licence rates without some check to prevent their being so high as to be prohibitory. I don't think the machinery of arbitration at all suitable; and any patentee determined to be obstructive and having the means could easily delay a settlement, or make it the starting point of interminable litigation. A plan which would make it against the patentee's interest to charge too high a rate would be most likely to work well; but no way of embodying that feature has occurred to me but one, which I fear is too complicated, and involves too much change in the general system of patents. I would reduce the fees payable on obtaining a patent to those barely sufficient to cover office expenses, but patentees should pay a tax on realised profits, to be fixed in amount in the following manner. Every patentee should advertise his rate for granting licenses, and at regular periods give in returns of the number of machines sold or equivalent particulars, and of licences granted, and he should be taxed on such returns at rates corresponding to his own licence rates; so that the higher he fixed his rate the larger would be his tax. The preliminary fees might also be deemed to be a payment in advance to account of the periodical taxes. The following enactment is loudly called for, namely, that every patentee shall affix the number and date of his patent on every article made under it; and a penalty shall be exacted from any one using the designation "Patent" without having a patent. It is very remarkable that whilst in the case of designs such an enactment is in force, the laws of patents, of so much greater importance, are without it.

Mr. Harry Chester writes:—

On Wednesday last I was, and on Wednesday next I shall be, unable to attend the meeting for discussing the Patent Laws. *Tempora mutantur nos et mutamur in illis.* I remember that, in 1854, the opinions, or (should I say?) the feelings, of those who attended our meetings were commonly in favour of patents and even of our present Patent Laws. Now everyone gives up the latter as mischievous, and many are altogether opposed to the former. Regarding the patent system as one of the worst of lotteries, wherein the blanks bear a higher proportion than usual to the prizes, I think that the Society, while it promotes improvements of the system, so as to minimize its evils, should set itself to consider whether any substitute can be invented for the encouragement of inventors, or rather, I should say, for the honouring of great inventors. It seems to me that, while we have orders of merit for the reward or acknowledgment of great statesmen, diplomatists, lawyers, and military and naval heroes, we want an order for the acknowledgment of the merit of great heroes of invention in Arts, Manufactures, and Commerce. I do not pretend to indicate in detail the conditions under which such an "Order of Inventors" might be useful.

I think the Society might appoint a committee to consider the subject; and I will only add here that it seems to me that it would be essential, first, that no award should be made in respect of any invention which had not been in use for a sufficient number of years to allow public opinion to be ripened in respect of it; and, secondly, that, in special cases, of great merit or need, a pecuniary recompense from public funds should accompany the grant of the order to the inventor, or to his heirs, or to both himself and his heirs.

Proceedings of Institutions.

Aberdeen Mechanics' Institution.—The sixth annual report states that in the science school the numbers who entered the different classes were as follows:—Mathematics, 24; mechanics (theoretical), 15; chemistry, 30; botany (winter session), 5; ditto (summer session), 10; total, 84. As compared with the former year, this shows a falling off of 35—there being a slight falling off in each class, except in that for mechanics—the greatest being in those for botany and mathematics. As to the natural history classes, the directors feel that these have failed in securing anything like adequate encouragement. With the exception of the junior class for mathematics, these classes were examined as usual by the examiners of the Science and Art Department, when the class for theoretical mechanics obtained two second and two third class Queen's prizes, and one student "passed." The class for chemistry, two second and two third class Queen's prizes, with one "honourable mention," and five students "passed." In systematic botany, and in vegetable physiology, one student gained "honourable mention," and one "passed." The school of art remains, in regard to numbers, very much the same as in the previous year. During the year, 140 students entered the class for males; 54 that for females: and 12 the day-class—making a total of 206. The average monthly attendance has been—male evening class, 53; female evening class, 28; day class, 7—total 80, or exactly the same as the previous year. Besides the students of the central school, just enumerated, various other schools are reported to have been under instruction in connection with the school of art during the past year, the number of pupils being 700. This shows a falling off of 220 pupils, which may probably be accounted for (says the report) by the unsettled state of matters and apprehensions caused by the application of the "Revised Code" to Scotland. One of the students carried off a national medal, which entitles the school to works of art of the value of ten pounds. Two others received "honourable mention." At the usual local examination by the Government Inspector twelve local medals were awarded, entitling the school to six pounds worth of works of art. Fourteen students of the school were "passed" in the second grade of examination in practical geometry and perspective, and in free-hand and model drawing seven obtained the mark "excellent," and three of them were awarded prizes. In the trade evening school the following are the numbers who joined and attended any time during the year:—Junior English class, 24; senior class, 15; French class, 32; German class, 9; English history class, 6; writing, arithmetic, and book-keeping classes, males, 201, females, 30; total, 317. Two of the above—those for German and English history—were new classes. The report notices the generous conduct of an employer of skilled labour on a large scale, Mr. Macdonald, of the granite works, who sent thirty of his apprentices to classes of the Institution, and paid their fees. With regard to the library, the quarterly average number of readers during the past year has been 818; the number of volumes issued has been 23,088; and the total ordinary income, irrespective of donations, has been £230—being an increase, as compared with the previous year, of 292 in the number of readers; of 4,620 in the number of volumes issued; and of £31 in the ordinary income. The number of volumes added to the library during the year is 1,354; the total number being 9,809. The balance sheet shows an excess of expenditure over receipts of £19, the receipts for the year having been £729 15s. 1½d., and the expenditure £748 16s. 5¾d., but, on the other hand, a sum of £125 from the library revenue, after defraying, with a trifling exception, its own charges, has been expended in the purchase of books and periodicals.

Burnley Mechanics' Institution.—The report for last year, 1863, says that the prosperity of the Institution has been affected by the pressure of the times. The library has been kept in good repair, and some 20 volumes of illustrated newspapers have been bound for perusal in the reading-room; 89 volumes of magazines and periodicals have been bound for circulation; and 41 miscellaneous volumes have been re-bound. The circulation of books has been greater than in any year except in that of 1862. The issues amount to 8,226, and a large number of the books read have been of a description calculated to instruct and improve. The reading-room has been amply supplied with newspapers, and with the leading reviews, magazines, and periodicals; but the proposed improvements in the room to afford larger accommodation and greater comfort to the readers have been again deferred. Nor has any attempt been made to open the long wished for conversation-room. In the evening classes the old and tried staff of teachers have been retained, several of whom have for years given their services without remuneration. The zeal with which they continue to discharge their important duties, and the deep interest they evince in the improvement of their scholars, deserve special acknowledgment. The scholars have shown steady application. In the examinations of the East Lancashire Union, 13 male students have gained merit prizes, ranging in value from 30s. each downwards; and seven have gained certificates of competency. Four female students have gained merit prizes, in value from 20s. downwards; and three have gained certificates of competency. In the examinations of the Department of Science and Art, South Kensington, five students have gained Queen's Prizes of the first class; five students, Queen's Prizes of the second class; and two students, Queen's Prizes of the third class; one has gained honourable mention; and two have passed. In the examinations of the Society of Arts, five students gained certificates of the first class; eight, certificates of the second class; and four, certificates of the third class. The results, notwithstanding the decrease of members in the evening classes, surpass those of any former year. Several young men who have acquired distinction in the examinations, have also gained the more substantial prizes of advanced employment and higher wages. The number of members on the books was 364, the same as in 1862. The number who attended the evening classes was 224, comprising—males, 177; females, 47; increase since 1862, nine. The President, Colonel Towneley, gives a donation of £20, and various other gentlemen contribute to the support of the Institution. The sum of £76 was contributed by the ladies of Burnley, at the annual *soirée*, and thus they have not only made good the deficiency in the ordinary income, but have cleared off the debt of £81, which remained at the close of 1862. The financial statement shows that the income was £606 14s. 2d., and that there is a balance in the treasurer's hands of £15 11s. 1d. Considering the great calamity that has fallen upon the industry of the district—that during part of the year one-third of the population were dependent on charity, or the parish, and that the rest have been struggling under greatly diminished means, the general condition of the Institution, if not all that could be wished, can hardly fail to be regarded otherwise than with satisfaction.

Wisbech Mechanics' Institute.—The annual general meeting was held on Wednesday evening, the 20th April, R. Dawbarn, Esq., President, in the chair. The report of the treasurer, Mr. Theo. Smith, stated the funds of the

past year had been £107 3s. 6½d. Of this, £16 4s. 3½d. was balance from last year, £74 2s. 6d. was for subscriptions, £3 8s. 8d. for the sale of newspapers, &c., £4 17s. 7d. realised by the public readings, £3 13s. 6d. by the lectures, and a donation of £5 from R. Dawbarn, Esq. The expenditure (embracing, among other items, one of £15 11s. for new books) amounted to £96 11s. 8d., thus leaving a balance for the ensuing year of £10 11s. 10½d. The report of the secretary (Mr. J. B. King) informed the meeting that there had been four lectures and five readings during the winter, that the issues of books for the past year amounted to about 2,000, that there were 1,072 volumes in the library in May last, that 103 new volumes had been since purchased. The present number of members is 204, and the average number throughout the year has been 204, against 227, average for last year. The Mayor, W. Hutchinson, Esq., was elected president. Votes of thanks were passed to the various officers for the past year, and the ex-President, in responding, said he had derived great pleasure from the public readings, and he hoped they would be continued in the next season. A member thought it would be advisable if the Institute had more lectures. The secretary stated that lectures did not pay; they had written to several eminent lecturers, but found that their terms were so high that they could not entertain them.

Manufactures.

Boiler Explosions.—The chief engineer's report to the last monthly meeting of the Manchester Association says that during the last month 311 engines have been examined and 418 boilers, 20 of the latter being examined specially and 4 of them tested with hydraulic pressure. Of the 418 boiler examinations, 333 have been external, 11 internal, and 74 thorough. In the boilers examined 255 defects have been discovered, 4 of them being dangerous. One case of explosion, where two boilers exploded together, is specially described. In this instance the series consisted of seven, in communication one with the other, all being externally fired. The rents in both the exploded boilers had taken place at the furnace or south end, and a portion of the shell, containing three or four rings of plates, had severed itself in each instance from the remainder. As to the cause, it appears that the water with which the boilers were fed was highly corrosive, a portion of it being derived from some coal workings a short distance up the valley, in which ironworks were situated. This water had eaten into the surface of the plate in a most remarkable manner, and the reporter had never seen any so severely affected. A considerable portion of the inside of the boilers presented an appearance very similar to a honeycomb, the cells running closely one into another, and in many cases penetrating so deeply into the body of the plate as only to leave a mere film of metal about one-sixteenth of an inch thick. The corrosive action was specially active at the overlaps, where it ate away a deep channel, completely undermining the edge of the plate, and in some cases penetrating as far as the body of the rivet. This channelling was quite independent of mechanical action, being as severe at the transverse as at the longitudinal seams. The plates which were most affected by this corrosive action were those nearly over the fire-bridge at the bottom of the boiler, and in the vicinity of the feed inlet. Those on the left-hand side of the mid-feather wall were more severely attacked than those on the right, in consequence, as it would appear, of the higher temperature, since the flames from the furnace passed on that side in the first instance. The boilers did not burst simultaneously, but the explosion of one caused that of the other, as attested by the fact that those on the works at the time heard two distinct reports. The true cause of this explosion is not to be found either in excessive pressure of steam or shortness of water, but simply in the reduced thickness of the plates by the ravages of internal corrosion. It is impossible, says the report, that competent inspection could have failed to detect the danger; while there does not appear to be any reason to doubt that the daily introduction of a small quantity of common soda along wilh the feed would have been as successful in arresting the corrosive action in this instance as it has been in others. For the last month three explosions are reported, from which fifteen lives have been lost, and also 25 persons injured. Not one of the boilers was under the charge of the Association. One exploded boiler was of the vertical furnace class, and heated by the flames passing off from three iron furnaces. These flames played in the first instance on the outside of the boiler, then passed through three neck openings into a central internal descending flue, and thence by means of a culvert to the chimney. This is a dangerous class of boiler. It is very inconvenient for complete examination, and the plates at the bottom upon which it sits may be seriously corroded without detection unless the boiler is lifted from its seat. Also the intense flames from the reverberatory furnaces impinge directly upon the shell externally, and the fires cannot be controlled as in the ordinary grate boiler, while, in addition, from its height and its being enveloped in brickwork, the best arrangement of water-guage becomes inapplicable as well as the fittings generally inconvenient and inaccessible. But not only is this class of boiler, from these circumstances, peculiarly liable to explosion, but when it occurs the consequences are peculiarly serious. The boiler, standing erect, is enveloped in a shell of brickwork some 15 or 20 feet high, and surrounded by three or more furnaces, from the flames passing off from which it is heated. The temperature of these furnaces is very high, and their fire-brick lining, as well as the masses of iron with which they are charged, are frequently at a glowing white heat. When the boiler explodes, its brickwork casing as well as the furnaces are demolished, and the débris, much of it red-hot, is showered in every direction, so that more injury is done by the flight of the fragments than by that of the boiler itself. An examination of the shell of the boiler after the explosion left no doubt as to its cause. The boiler was an old one, and had been repeatedly patched; while the edges of the plates where the fracture had taken place were reduced by corrosion for a considerable distance to the thickness of a sheet of paper. The jury brought in a verdict of manslaughter against the fireman, as well as against the proprietor of the works, and his son, who acted as manager. Another explosion, which resulted in the death of one person and in injury to six others, occurred at a saw mill, and was due to the collapse of a furnace flue, and is an illustration of the necessity of strengthening all such flues with hoops or other suitable means. The boiler was of Cornish construction. The reporter considers that the fundamental cause of the explosion in this instance was mal-construction of the boiler. Another explosion, which resulted in the loss of two lives, affords an additional illustration of the danger so often pointed out in these reports, as attendant upon the use of externally-fired boilers, especially when they are fed with sedimentary water, and not provided with sufficient blow-out apparatus. The boiler in question was No. 3 in a series of eight, working side by side, and connected together both by the steam-pipe and feed-pipe, They were of plain cylindrical egg-ended construction. externally-fired, and set with a flush flue; their length being 40 feet, their diameter 5 feet, and thickness of plate three-eighths of an inch. The boiler gave way at one of the transverse seams of rivets situated about eight feet from the front end, and very near to the fire-bridge. The rent commenced at the bottom, and then continued throughout the entire circle of rivets, severing the shell completely into two sections. The reporter draws attention to the fact of an explosion having occurred to an externally-fired boiler, from the failure of a single transverse seam of rivets, which neither by leakage nor by any appearance of burning on the outer surface of the plate gave any warning of

danger—a fact which it is thought affords a clear example of the treacherous character of this class of boiler. The reporter remarks that during a period of scarcely three months there have occurred eight explosions, from which twenty-nine persons have been killed, and forty-two others injured; while five persons connected with the management of these boilers have been committed for manslaughter. The causes of all these explosions have been extremely simple; in three cases, the choking of the feed pipes through frost; in two others, wasting of the plates to the thickness of a sheet of paper; and in the sixth the mal-construction of the boiler. Ironworks appear to maintain their position at the head of the list, both for the number and fatality of their explosions, and, under these circumstances, it may not be unwise to re-consider the policy now generally adopted at these works, viz.,—that of employing the more primitive description of engineering arrangements, in preference to those of a more modern character, and now widely adopted in other branches of industry. It is often argued that the rough class of labour obtainable at ironworks necessitates the continuance of primitive and rough mechanical appliances; an argument, it is thought, that admits of question. True economy in engineering matters is only to be found in the employment of the best material and workmanship. The continued use of inferior and rough boilers, tends to perpetuate inferior and rough workmen; while, on the other hand, the use of a superior description would stimulate and raise them. Where boilers of a superior class have been adopted, they have been found to be productive of economy in working, as well as of human life, and there can be no reason to doubt that these advantages would follow their adoption at ironworks. A very frequent source of explosion, and one by no means peculiar to any class of works, is that of having no spare boilers, so that the Sunday becomes the only day for examination and repair, when the time is too short for either to be satisfactorily done, and thus the boilers are worked on in a dangerous state. Apart from other considerations, which need not here be entered upon, the practice of Sunday work is bad engineering. Boilers are injured by being suddenly cooled, and should never either be emptied when hot, or filled with cold water. Examinations and repairs of the plates, if hastily done, are sure to be scamped, and patches temporarily and insecurely hung on with bolts, get to be substituted for soundly riveted plates. It must not be lost sight of, that explosions do not occur to those who are careful in the management of their boilers, and therefore it may fairly be asked, if the carelessness of those who allow their boilers to explode is just to the body of steam users as a whole? It cannot but be feared that the continued occurrence of these fatal explosions will at length provoke the Government to undertake a system of inspection, and however wisely such a course may be carried out, it could hardly fail to prove irksome to the steam user, and to cramp the many careful for the careless few.

Colonies.

The Athenæum and Mechanics' Institute, Otago, has, during the last year, made great progress. The year 1863 was commenced with 223 members; during the first quarter there was a rise to 314, and during the second to 436. The increase continued during the latter half, and at the close of the year there were 563 members, and a balance of £156 13s. 2d. to the credit of the Institution. The additions made to the library during the year represented 984 volumes, and the issues were 15,537.

Alpacas.—During the month of December, 1863, the flock of alpacas in New South Wales, brought five years since from South America by Mr. Ledger, have been shorn. The flock now numbers 348 animals; the number clipped was 300, and the yield was 18½ cwt., being two cwt. more than was given at the last shearing, when 420 animals were shorn. This difference is attributed to the cross-breeding and to the mortality that has occurred amongst the lambs. As the result of the cross-breeding between the alpaca and the llama, the flock now consists almost entirely of pure alpacas, born in the colony. Of the wool sent down there is only half a bale of llama; all the rest is alpaca, of the qualities that have been so highly commended by Mr. Titus Salt, of Bradford. The alpacas have recently been removed from Arthursleigh to Wingelo, an adjacent station belonging to Mr. Edward Payten, who has been appointed superintendent of alpacas. There are many facilities on the station for the separating and weaning of the lambs, so that the Government will not be called upon for much further expenditure. Upon Mr. Charles Ledger giving up the charge of the alpacas, his brother, Mr. Arthur Ledger, received the appointment, but he subsequently resigned it in consequence of what he considered the unjust treatment of his brother by the late Government. It will be remembered that the flock of alpacas were, a few months after Mr. Ledger's arrival in the colony, purchased of him by the Government. Notice has lately been given in the Assembly by Mr. Wilson, the Minister for Lands, of a resolution to the effect that it is desirable that the alpacas should be no longer retained as public property, but that they should be absolutely disposed of by the Government in such manner as may be found most convenient.

New Zealand.—A Wellington paper says:—"Whether Wellington be chosen as the new site for the seat of government, or whether its removal to Nelson or Picton takes place, this port has been rapidly acquiring for itself the character of being the natural centre for steam, and the manner in which this has been tacitly admitted by the colony has been exemplified in the new mail proposals recommended by the committee of the House of Representatives, and approved by the government. Although every year the steam services have been altered, the requirements of the times necessitate continued alteration and extension; and for a long time to come whenever the Assembly meets it will in effect have again to agree to the first of the five resolutions passed on the 7th December, 'That the whole of the existing postal steam service should be remodelled, and all existing contracts brought to a conclusion, by notice or by arrangement, as soon as possible." By the present postal service there is an average weekly communication with both north and south. The steamers leave oftener, but the clashing of dates practically reduces the six departures north and the five south to a weekly mail communication. The Assembly has recommended that there should be a weekly mail communication between Southland and Otago, Canterbury, and Wellington, a weekly communication between Wellington, Napier, and Auckland, and a weekly communication between Wellington, Picton, Nelson, Taranaki, and Manukau, provided such a service can be performed for the sum of not more than £40,000. From Wellington, therefore, there will in a few months be two mail steamers a week to the north and two a week to the south. Thus Wellington becomes the centre from which the mail service radiates."

Gold in Queensland.—From the Calliope gold fields good accounts continue to be sent, and now and again rumours of heavy finds are conveyed, either through the columns of the local journals or though private sources. A nugget weighing five pounds was certainly obtained, and instances of other large pieces being disentombed are occasionally recorded. At the Talgai diggings the miners have been following the example of the townspeople, and keeping holiday, so that no very startling accounts have been received from there of late. There appears, however, to be an impression on those who have visited the district that a good gold field will yet be found in it.

Hotels in Tasmania.—A Hobart-town paper says:—"If half a dozen people could be got together for the formation of a hotel company, similar to those which have proved so great a success in many parts of England, not

only might the trade of Hobart-town, as the capital of Tasmania, be greatly stimulated, but we should have numbers of persons attracted to it, as formerly, from India, and it could not fail, at certain seasons of the year, to draw a large circle of visitors from the surrounding colonies. Many are deterred from coming, for the purposes of business or with a view to the purchase of land, who would most certainly favour us with their visits if we had only better hotel accommodation. And there are others who have heard of our salubrious climate and of our charming scenery, but have never felt the effects of the former nor had an opportunity of judging of the beauties of the latter, under the impression that they should pay too dearly for it in the want of good hotel accommodation if they made the attempt."

Steam Tugs on the Waikato are shortly expected, their intended use being to take up supplies to the military settlements to be founded along the banks of the river. Their light draft of water and power will fit them for this special duty. It is likewise intended to build a number of flats, to be towed by these steamers, and which may be detached at the various settlements as they proceed up, on the return trip the empty cargo of flats being taken back. Thus a constant communication will be kept up.

Coal in New Zealand.—A Nelson paper says that although there is abundant evidence of the existence of coal of the best quality and unlimited in quantity, the inhospitable nature of the coast, the want of good harbours and resident settlers, make it difficult to establish confidence among private capitalists so as to induce them to embark in the working of a coal-field. The local government had resolved to assist, but the ordinary revenue does not admit of such assistance, and it was resolved to obtain a loan. Captain Clouston, in his recent survey of the Mokihinui harbour, speaks favourably of the facilities for steam colliers built expressly for the service, and thinks that such vessels, having no greater draught of water than eight feet, might with safety trade between Nelson and Mokihinui. The coal crops out in good workable seams at several spots on the banks, the nearest place being only two miles from the sea. It is superior to Sydney Newcastle coal, and little if at all inferior to the best English. The largest beds are thirteen feet thick. Gold continues to come in from the Upper and Lower Buller in a coarse and nuggetty form, but the country is so inaccessible at present, in spite of £25,000 worth of bridle and foot tracks, that old hands are getting more and more shy of the speculation. It is only by settling the interior that this wealth will be developed.

Agriculture in New Zealand.—The grass crop has been a great deal of it gathered in, and the produce has been universally abundant. Although there were frequent showers yet the hay has been almost universally well got. Evaporation proceeds so quickly in this climate that although frequently straightened for hands the farmer has been able to render the fine weather sufficient for his purposes. The growing wheat crop also promises generally to be a highly productive one.

Tobacco Cultivation in the Cape Colony.—At the Humansdorp Agricultural Show, Mr. C. A. Rautenbach, of Wolve Kraal, Humansdorp, Eastern Province, obtained the first prize of £15 for the best sample of colonial-grown tobacco. Tobacco has been grown in the Cape Colony for many years, but owing to the fact that the farmers manufacture it in the most primitive style, rolling the leaves up rope-fashion, and drying it in the sun, in which state it is called boors' (farmers') tobacco, it is only used by farmers themselves and their black and white servants. Lately, those who are anxious that the capabilities of the colony should be more fully developed have pointed to the fact that there are isolated instances in several parts of the colony of farmers producing several kinds of tobacco. These farmers have proved that the soil is capable of growing every known species of the plant in great perfection, and it was felt that some encouragement should be held out to farmers to depart from the orthodox fashion and turn out the leaf in the "Cavendish" or "Golden leaf" style Mr. Rautenbach did this on the occasion in question. He produced a hundred pounds weight of tobacco done up in cakes, and looking exceedingly handsome, although a close inspection revealed the fact that much knowledge and experience was yet required in the preparation. The judges unanimously awarded Mr. Rautenbach the first prize, and he has engaged to produce one thousand pounds weight from his next crop. The plant produces three crops of leaves per annum in this colony, is strong and healthy, and transplants with ease. Many farmers in the colony are anxious to prepare this article of commerce fit for the export market, but owing to their being placed in such an isolated position, and this colony being to a great extent ignored by the world, they have neither means nor the knowledge to enable them to compete with other markets. Any information on the subject would be gladly received, and distributed among the Cape farmers, on being addressed to Mr. A. Barfield, editor of the *Telegraph* and *Standard*, Port Elizabeth. It should be observed that the eastern province, of which Port Elizabeth is the chief port, and which exports nearly a hundred thousand bales of wool per annum, is the English portion of the colony, and has much more energy, perseverance, and wealth than the western province, which is chiefly Dutch.

Obituary.

The Right Rev. George Davys, D.D., Lord Bishop of Peterborough, who died at the age of 84 years, was born on the 1st October, 1780, and was the son of Mr. John Davys, of Loughborough, Leicestershire, and of Rempstone, Nottinghamshire, by Sophia, daughter of the Rev. B. Wigley, of Sawley, Derbyshire. He was of Christ's College, Cambridge, graduating as tenth wrangler in 1803—when Archdeacon Hoare was second wrangler and second chancellor's medalist, and Lord Wensleydale fifth wrangler and senior chancellor's medalist. He was ordained deacon in 1806, and priest in 1809. In 1811 he became possessed of the advowson of the small rectory of Willoughby-on-the-Wolds, Nottinghamshire, value £87; population 465, and took pupils. In 1814 he married Marianne, daughter of the Rev. E. Mapletoft, rector of Anstey, Hertfordshire, who died December 3rd, 1859. He held Willoughby till 1831, two years previous to which he was presented by the Lord Chancellor to the rectory of Allhallows, London-wall, value £450; population 1861. At this time he was nominated preceptor to her Royal Highness the Princess Victoria, and he resided at Kensington. In 1831 he was made Dean of Chester, on the promotion of Dr. Philpotts to the episcopal bench. In 1839 he was consecrated Bishop of Peterborough, on which occasion he resigned his deanery and his London living. As a bishop, Dr. Davys was universally respected for the simplicity of his life, and the gentleness and affability of his manners. Of all religious societies, of all local institutions, he was a liberal and hearty supporter, and identified himself with all the useful and honourable movements within his diocese. As a writer, he produced several children's books of history which are still text books in schools, and various cottage tracts.

The name of James Beadel has been familiar to landed proprietors and agriculturalists for the last thirty years, as head of the well-known firm of Beadel and Sons. There were few men more thoroughly acquainted with land, its value and requirements, and few indeed on whose word both tenant and landlord were more content to rely. He had long been a Commissioner of the Essex turnpike roads, attending the meetings occasionally, and assisting by his practical advice. He was, too, one of the founders of the Central London Farmers' Club, to the success and usefulness of which he contributed by his lectures, being ever ready to use his influence for carrying out on the farm the views and principles he broached in the club-room,

especially in respect to covered homesteads, which were adopted by his efforts and under his superintendence on several large estates. By these things he will be remembered as one of the practical agricultural improvers of the day, while in private life the qualities of his heart and his frank open bearing will cause him to be widely mourned as a friend. He was born on the 2nd of December, 1799, at Witham, where his family had been settled for many years. He claimed descent from Bishop Beadel, of Kilmorey, in Ireland, who was also a native of Essex. Mr. Beadel retired from business about two years before death, owing to an attack of paralysis, and he died on the 22nd of November, 1863. He was elected a member of the Society of Arts in 1852.

Forthcoming Publications.

Twelve Songs from the Plays of Shakespeare: illuminated with suitable borders in gold and colours, partly after illuminated works of the fifteenth and sixteenth centuries. By Mrs. Hoskyns-Abrahall. (*Day and Son.*) The work is about to be published by subscription, and will consist of 12 pages quarto, price one guinea, and will comprise the following songs:—1. "Full fathom five thy father lies," *Tempest;* 2. "Where the bee sucks," *Tempest;* 3. "Who is Sylvia?" *Two Gentleman of Verona;* 4. "Come away, come away, Death!" *Twelfth Night;* 5. "Take, oh! take those lips away," *Measure for Measure;* 6. "You spotted snakes," *Midsummer Night's Dream;* 7. "When daisies pied," *Love's Labour's Lost;* 8. "Tell me where is fancy bred," *Merchant of Venice;* 9. "Under the greenwood tree," *As You Like it;* 10. "Blow, blow, thou winter wind!" *As You Like it;* 11. "Come, thou monarch of the vine!" *Antony and Cleopatra;* 12. "Hark! hark! the lark at heaven's gate sings." *Cymbeline.*

Notes.

Silk-worms.—M. Onesti has found that wood soot, if sprinkled over silk-worms attacked with *fébrine*, effects an almost certain cure, or, at all events, prolongs their lives until the cocoons are finished. The Minister of Agriculture has addressed a circular to the *préfets* of the sericultural departments of France, and has requested that a commission be formed to report on the value of M. Onesti's discovery. A very interesting letter from M. Guerin-Menneville, printed in a recent number of *Les Mondes*, gives many particulars of the progress of sericulture in France. Among other things, it is mentioned that M. Simon, charged with a mission to China to report on the best breeds of worms, *inter alia*, has sent home a box of eggs *viâ* Siberia, which have arrived safely, and are now being distributed, and are also being experimented on at the Imperial farm at Vincennes.

Value of Land in the City of London.—It is stated by Mr. Alderman Mechi, in a letter in the *Gardeners' Chronicle*, that a good deal of land about the Royal Exchange is now worth one million five hundred pounds per acre, and that a site in that neighbourhood, about the size of a nobleman's drawing-room, would command a ground rental of £1,000 per annum, equal to the rental of a thousand acre farm.

Roberts Testimonial.—A meeting took place on Wednesday, the 27th inst., in the rooms of the Society of Arts, to concert measures for raising a fund for a testimonial which shall properly record the eminent services of the late Richard Roberts. Admiral Sir Edward Belcher was called to the chair; and letters were read from the Duke of Sutherland, the Earl of Caithness, Lord Stanley, M.P., Mr. Pender, M.P., and others, expressing their sympathy with the cause, and authorising their names to be placed on any committee which might be formed. The following resolutions were passed:—Proposed by W. Fairbairn, Esq., F.R.S., and seconded by Thomas Bazley, Esq., M.P., "That this meeting is of opinion that the eminent services which Mr. Richard Roberts has rendered to the manufacturing industry of this country, and to the world at large, by his useful inventions, demand some substantial and permanent record; and that the most appropriate tribute to his memory would be in the first instance to provide for the independence of his only daughter." Proposed by Thos. Webster, Esq., F.R.S., and seconded by Zerah Colburn, Esq., "That a fund be raised by public subscription, and that the following gentlemen be appointed as a committee to carry out the objects of the foregoing resolution:—The Duke of Sutherland; the Earl of Caithness; Right Hon. Lord Stanley, M.P.; Admiral Sir E. Belcher; J. Pender, M.P.; Thos. Bazley, M.P.; W. Fairbairn; Thos. Webster; Col. French; Bennet Woodcroft; S. B. Lumb; Zerah Colburn; E. Jones; P. Le Neve Foster, Hon. Sec.; with power to add to their number."

Correspondence.

The Proposed New Buildings at South Kensington.—Sir,—The present state of the Exhibition Building, with one dome only standing, affords an opportunity of testing what should be the character of the upper features of any building which may hereafter be erected in Cromwell-road, that is, in so far as its effect is to conduce to that of the Horticultural Gardens. I would invite any one interested in the subject to take his stand in front of the conservatory, and then look alternately towards that corner where the dome still remains, and towards that where it has been removed. I think it will be perceived at once that the gardens look much larger when looking towards the corner where the dome has been removed than towards that where it yet remains. It is evident in fact that the large proportion of the dome dwarfs the intervening space, and the whole appearance of the gardens in that direction. Noble as large proportions in architecture are of themselves, yet in some respects and cases they are to be avoided. To what does this point? I would say evidently to any future building on the site of the exhibition having such features of sky line as should produce their effect chiefly by elegance and repetition rather than by great size. The shortcomings in the Horticultural Gardens are chiefly those which arise from their small area, and nothing could be more erroneous than emphasizing these by features of great size (especially in the skyline) of any building hereafter to be erected on a site so contiguous, and which must by its position always form part of the *coup-d'œil* from the gardens. I would also add that it would be well to keep an open space in the centre of the façade in the Cromwell-road, so as to afford a view to the outside public (to the working man in fact) of the Horticultural Gardens, and of the memorial of the exhibition surmounted by the statue of the late Prince Consort. The new buildings in fact would then be in two blocks or groups rather than in one, and the centre open space would not only afford a distant perspective view of the gardens, and be a great relief to the effect in Cromwell-road, but would also give the edifice a space for carriages to set down and take up on its own ground, and likewise afford suitable opportunities for introducing a variety of artistic decoration of various and appropriate kinds for the open air, as mosaics, sculpture, &c.; and if some portion of this space were in addition roofed with glass, carriages might set down and take up under cover. Besides this also, the adjuncts of beautiful plants and pictures in water glass might in this case be introduced, or even large distemper paintings, as cartoons of design and colour for mosaics, which might afterwards be executed from them, and which probably will be found to be the

only kind of pictorial mural decoration that will be really lasting in this country.—I am, &c., Epsilon.

The Bradfield Reservoir.—Sir,—Your correspondent on this subject in the last number of the *Journal*, attributes the cause of the late disaster to the inefficient manner in which the puddle-wall was made. This appears to me to be the unanimous verdict of all who have given judgment on the question. I have not been to the scene, and all I know of it is from description, and from a drawing in the *Illustrated London News*. Without differing from the opinions of those who have already pronounced, I wish, as I have not seen this feature of the subject adverted to, to say a word or two on the form of the embankment, which, as I learn from the drawing mentioned, is in a straight line. Imagine the weight of 114,000,000 cubic feet of water; add to that its percussive force as it swept in large waves along the entire length of the reservoir: and one can easily understand the enormous lateral strain to which the embankment would be subjected. Now, had its form been that of an inverted arch, that is to say, with its crown inwards, I think I dare venture to say that even with the inferior material and labour employed, the work would have been capable of resisting the pressure brought against it. Of course, I assume the buttresses to be firmly set; and the springs of the arch would require to be protected within the reservoir by a superficial straight line of masonry.—I am, &c., B.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Entomological, 7.
British Architects, 8. Annual Meeting.
Asiatic, 3.
Royal Inst., 2. Anniversary Meeting.
R. United Service Inst., 8½. Mr. H. Bessemer, "Employment of Cast Steel for the Manufacture of Ordnance and Projectiles."

Tues. ...Civil Engineers, 8. 1. Discussion upon "Locomotive Engines for Steep Gradients and Sharp Curves," and upon "Impedimental Friction between Wheel Tires and Rails." 2. M. Pernolet, "Manufacture of Coke."
Pathological, 8.
Photographic, 8.
Anthropological, 8.
Royal Inst., 3. Professor Marshall, "On Animal Life."

Wed. ...Society of Arts, 8. Mr. F. A. Paget, "On the Testing of Chain Cables."
R. Society of Literature, 8½.

Thur. ...Society of Arts, 8. Cantor Lectures. Dr. Crace Calvert, "Chemistry applied to the Arts—Animal Liquids."
Antiquaries, 8.
Linnæan, 8.
Chemical, 8. Sir B. C. Brodie, "On the Organic Peroxides Theoretically Considered."
Artists and Amateurs, 8.
Royal Inst., 3. Mr. John Hullah, "On Music (1600—1750)."

Fri. ......Philological, 8.
Royal Inst., 8. "On Iridium, &c."
Archæological Inst., 4.

Sat ......Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

Patents.

From Commissioners of Patents Journal, April 22nd.

Grants of Provisional Protection.

Air, &c., forcing, blowing, or exhausting—801—J. G. Beckton.
Arming war vessels—929—J. Burchall and E. Burrows.
Bottles, &c., fixing or closing capsules on – J. Neilson and J. Gillies.
Churning and butter-making machines—778—T. Bradford.
Crinolines—873—J. H. Johnson.
Drilling machine, portable—691—B. Fowler, jun.
Easel, combination – 829 – F. Potts and A. H. Green.
Electric or telegraphic conductors—833—W. E. Newton.
Fibrous materials, preparing and spinning—811—J. Greenwood.
Fibrous materials, treating vegetable—887—W. Clark.
Gutta-percha, leather, &c., preparation of—735—W. Forgie.
Hats, &c., looms for weaving—815—W. E. Newton.
Horticultural structures, glazing of—875—C. Beard.
Iron or steel plates, water-tight joints in—803—H. H. Mills.
Iron ships, applying metal sheathing to—849—G. B. Cornish.
Kilns or retorts for cooking, &c.—855—T. V. Lee.
Lamps—903—A. Smith.
Lighthouses, &c., construction of—845—J. N. Douglass.
Looms—767—C. Hartley.
Looms—858—J. Nichols.
Looms for weaving cords, &c.—837—J. Smith.
Looped fabrics, manufacture of—919—W. Gadd, jun.
Machines, electro-magnetic induction—899—J. B. Thompson.
Manufactories, instrument for registering the time of arrival and departure of work-people in—821—J. Hunt.
Manures—773—J. Robbins.
Metals, applying pressure to the rolling and drawing of—909—M. A. F. Mennons.
Minerals, getting or cutting—895—J. Nisbet.
Mines, &c., apparatus for pumping water out of—835—T. Briggs, jun.
Motive power, transmitting and multiplying—917—W. Clark.
Mowing and reaping machines—915—M. L. Peters and W. Harkes.
Oil cans, &c.—855—W. Clark.
Ordnance, &c., breech-loading—869—J. Snider, jun.
Paper manufacture—817—J. J. Lundy and R. Irvine.
Photography—843—N. Sarony.
Pipes, joints and stop-cocks for—923—W. E. Newton.
Plate glass, machinery for grinding, &c.—881—N. Wood and J. Stockley.
Pouches, cartridge and percussion cap—851—W. Clark.
Printed woollen velvets or plushes—859—E. T. Hughes.
Printing from type by electricity—893—J. H. Simpson.
Pumps, rotatory—889—A. Rodger.
Purse frames, &c., ornamenting steel and wrought iron for—867—F. Weintraud.
Railway carriages, oil boxes for oiling the axletrees of—911—F. G. Piemont.
Railway engines, &c., safety hooks and couplings for—913—T. Chamberlayne.
Railway rails, &c.—807—E. Stott.
Railway signals—853—E. D. Chattaway.
Railway signals from a train in motion—861—W. T. C. Pratt.
Railways, connecting rails for—907—A. Earnshaw.
Railways, permanent way of—863—J. H. Johnson.
Refrigerators—877—J. Picking.
Reservoirs, &c., regulating the flow and level of water from—879—J. Lascelles.
Sapota mulleri or bullet tree, juice of—820—S. W. Silver.
Ships, construction and ventilation of—847—A. McLaine.
Ships, life, and property at sea, &c., preservation of—772—J. Rees.
Spinning frames, self-acting saddle for wet flax—738—W. Leuty.
Surface condensers, construction of—891—J. Jordan.
Table tops, fastening of—727—J. Edis.
Textile fabrics and yarns, sizing of—857—J. Lightfoot.
Textile fabrics, dyeing and printing—769—J. Lightfoot.
Thermometer, maximum mercurial—809—J. Hicks.
Umbrellas, manufacture of—813—E. Ambrose.
Walking sticks, &c., applying an almanack or a thermometer to—799—M. Kurts.
Warming and ventilating, apparatus for—831—T. Richard.
Watches, lockets, &c., fastenings for attaching—927—W. Reading.
Weights, machinery for raising—897—A. B. Brown.
Window sashes—805—W. Holbrook.

Patents Sealed.

2636. R. Littleboy.	2656. R. Smith.
2637. B. Steinmetz.	2664. S. Procter.
2643. W. E. Gedge.	2665. E. Oldfield.
2644. I. Baggs.	2686. F. Durand.
2645. J. Willcox.	2717. R. Eaton.
2646. A. Blake.	2751. C. Coates.
2647. E. Clifton & B. Greenwood.	3105. J. Wright.
2650. J. C. Wilson.	3233. D. Adamson.
2654. J. Hutchinson and J. Hollingworth.	48. J. Ramsbottom.

From Commissioners of Patents Journal, April 26th.

Patents Sealed.

2672. R. B. Jones.	2714. F. J. Pastorelli.
2673. J. Kennedy.	2720. J. J. Revy.
2674. R. A. Brooman.	2722. J. Livesey and J. Edwards.
2679. A. R. Le Mire Normandy.	2732. J. H. Maw.
2680. F. N. Gisborne.	2762. W. H. Perkin.
2681. J. Nash.	2803. D. Dawson.
2687. M. J. Roberts.	2817. G. Davies.
2689. A. Turner and W. E. Newton.	2828. W. Robertson.
	2852. W. E. Newton.
2690. B. Russ.	2878. W. Cowan.
2696. J. H Johnson.	2894. H. Hirzel.
2700. W. Tasker, jun.	2936. F. Watkins.
2702. W. Law.	3044. J. Bowron and G. Robinson.
2705. W. Pope.	3204. E. T. Hughes.
2706. J. Wilson.	251. J. Marshall.
2707. S. Holman.	265. H. Bessemer.
2708. E. Jones.	319. C. Mather.
2713. T. W. Alderton.	492. E. C. Shepard.

Patents on which the Stamp Duty of £50 has been Paid.

994. A. Dugdale.	1081. W. Horn.
976. W. and T. Ryder.	1041. J. S. Templeton.
980. R. A. Brooman.	1051. F. C. Warlich.
1017. F. J. Bramwell.	1085. F. J. Bramwell & W. Owen.

Patents on which the Stamp Duty of £100 has been paid.

1290. R. Bennett.	1150. R. Bodmer.
1153. W. C. Cambridge.	1167. S. Sunderland and R. Dean.
1160. W. Clark.	

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, MAY 6, 1864. [No. 598. Vol. XII.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at 8 o'clock.

May 11th.—"On the Economy of Agricultural Cottages, considered with regard to the interests, the position, and the duties of the labourer, the tenant-farmer, and the landowner." By J. Bailey Denton, Esq.

Labourers' Cottages.—Denton Prizes.

The following is the report of the Judges appointed to decide on the competition for Prizes for designs of cottages for the labouring classes, offered by J. B. Denton, Esq., through the Society:—

To the Council of the Society of Arts.

London, April 20th, 1864.

Gentlemen,

After a careful consideration of the Designs submitted to us, numbering in all 134, from 107 competitors, residing in all parts of the United Kingdom, we feel it incumbent on us to offer a few remarks in explanation of our decision.

We would observe, in the first place, that although the terms of the competition are such as to limit our attention rather to small matters of detail, affecting the stated cost, than to permit our actually selecting the best design which could be built for a reasonable outlay, we have given our consideration to the whole subject of cottage accommodation for the labouring classes.

Notwithstanding that the offer of these prizes has been the means of procuring so large a number of Designs, we cannot but consider that no satisfactory solution of the problem proposed has been given. The possibility of erecting really good and substantial cottages for the labouring population of this country generally, with the stated accommodation, at a cost not exceeding £200 a pair, all profits and expenses included, is not demonstrated by the present designs. This is shown by the remarks of the competitors themselves and by the shifts they have found themselves obliged to adopt in order to reduce the cost, as well as by those exceptional cases where, owing to some peculiarly favourable circumstances, or by omitting some feature not so important in one locality as in another, a result somewhat approaching that which is desired in the cost has been arrived at, not in any case, however, without contravening the terms of the competition in reducing the given prices of certain items.

We particularly mention good and substantial cottages of the given dimensions, for it is to such alone that our attention has been directed, as it cannot be the desire of the donor of the prize or the wish of the Society of Arts to encourage the erection of cottages of an inferior character. We have in all cases taken the cost of cottages to be erected in pairs, it being obvious that a better building can be provided for a stated sum when attached to a similar one, and thus the cost of some of the walls, roofs, &c., divided between the two. On the other hand, the cost of a row of ten pairs of cottages can hardly be taken as a fair criterion of the value of a single pair, a group generally much more frequent and desirable than the larger number.

Several items are included in the terms of the competition which we think should have been more clearly defined or excluded altogether from the estimate, for it is obvious that the words "water supply, well, fencing, paving, &c.," may be taken to imply very different items of expenditure by different individuals in a competition. Again, while brickwork as a material for walls of cottages is almost unknown in some parts of the country, it is obvious that rubble walling must be reduced to value in the terms of brickwork to get at a fair comparison of the cost according to the terms of the competition, and similarly roofing, if of tiles, must be valued as slates at the given price.

The paragraph referring to the height of rooms seems to have been differently understood by the competitors, the word "clear," at the end of the sentence relating to this matter, having been taken by some to mean the height of the ground-floor up to the ceiling, while the generality of designs allow only nine feet, including the thickness of ceiling, upper floor joists, and flooring.

It is true that in some parts of England, where bricks can be obtained at from 18s. to 20s. a thousand on the spot, and where certain facilities exist for obtaining other materials, where timber is inexpensive and concrete foundations are scarcely required, a certain kind of cottage may possibly be erected for the sum named in the instructions (though generally speaking it is not so), but it would be highly improper, without the addition of considerable improvements, at increased cost, to recommend such cottages as fit to be erected for the occupation of the labouring classes generally.

Of all the plans submitted, therefore, none can be said strictly to conform to the terms of the competition, both as to the accommodation required and the cost. To none, therefore, can we, strictly speaking, award the prize. We, however, deem the design marked by you as No. 23 to be, on the whole, the one most conformable to the terms of the instructions, as well as to the proper requirements and conveniences of a labourer's cottage, and, therefore, we recommend that the prize of £25, open to the United Kingdom, be awarded to this design.

It must be understood as our opinion, however, that, generally speaking, brickwork of 9 inches thick for outer walls in exposed situations is not sufficient to resist the weather, and therefore we should recommend some system of hollow walls to be adopted, which would of course add to the cost. With reference to this we would call attention to the remarks of a competitor (No. 71), to which we quite assent. He proposes to build the cottages shown in his design in nine-inch solid brickwork, the stipulated cost not allowing him to make them of greater thickness, and adds "Should it be thought advisable to increase the expenditure for this purpose he would recommend hollow walls built in brickwork, the space between being 2½ inches, and the walls bonded together with wrought-iron ties."

It is only fair to observe that several other competitors (as Nos. 2, 14, 30, 81, and others) show various systems of hollow walling, or some kind of hollow bricks.

Though not specially mentioned in the instructions, an oven is, we consider, often a matter of importance, and if made common to both cottages (as in Design No. 71) may be added without any great expense.

We cannot recommend the ordinary water-closet apparatus with cistern pipes, &c.—so liable to get out of order—for general adoption in ordinary labourers' cottages. A modification of this by the use of a common syphon pan, with the ordinary privy or cesspool, will be found sufficient; and when, by means of ashes, clay, or other deodorising substances thrown into the pit, the loss of the soil is prevented, the matter is not unimportant.

The use of cast-iron casements, as in Design No. 23, is not desirable, owing to the difficulty of making and keeping them water-tight, their liability to fracture, and the difficulty of repairing them. We should recommend sashes or casements in wooden frames, and no lead lights for other than ornamental purposes.

The internal walls of some of these designs are not plastered, thus evincing an attempt to save cost. Perhaps, in some cases, with very good bricks and in certain localities, plastering may not be required, but generally speaking it is desirable to plaster the bedrooms and living rooms of cottages.

In some of the designs the living room floors are described to be common flat brick paving. Good paving tiles at least should be used, but we consider wooden floors, for the living room as well as the bedrooms, generally indispensable to the comfort of the inhabitants.

The Design No. 23 shows well-ventilated pantries and good coal-stores; also a well, common to both cottages, and a rain-water butt.

The partitions shown in some designs (particularly No. 71) in the upper floors, of $\frac{3}{4}$-inch boarding only, are not sufficient except, perhaps, next the staircase. The separation between the rooms should be of a more substantial character.

Design No. 23, to which we award the chief place, would be greatly improved by dormers over the upper windows at the back, so as to give greater space for light and air to, as well as to improve the appearance of, the cottage.

In all cases when the sloping parts of slate roofs especially (and generally also of tile roofs) are made a portion of the ceiling of the upper rooms some plan should be adopted to check the access of heat and cold.

It is stated that cottages of the same design as No. 31 are being erected in large numbers in Yorkshire at a cost within the amount stated in the terms of the competition; but we find in the estimate that the brickwork is taken at £6 a rod instead of £8, as in the instructions, and other work at proportionately low prices.

With regard to the prize offered specially to the members of the Architectural Association, the number of designs sent in is small in comparison, and we regret to observe that the attempt to conform strictly to the terms of the competition as to cost, seems to have led to the sacrifice of essential conveniences and comforts, although there is no design which we can say has successfully met the instructions even in this respect. Either in substituting tiling at a flat pitch for slates, or by reducing the heights of some rooms, or placing the water closet inside the walls of the house, or in some other way, attempts have been made to meet the instructions, which only serve to preclude the possibility of our recommending any of the designs submitted for the prize, or of according to them our commendation as generally fit to be adopted as dwellings for labourers, without a variety of improvements.

We would observe, however, that No. 15 offers a suggestion deserving of remark, as it submits a plan with one of the bed-rooms on the ground floor, whereby the size of the upper rooms is increased and the boys and girls of the family are more completely separated. Only one door to the house is provided, and the scullery is reduced in size. This plan obviates in a measure the difficulty arising from the area required for the upper floor of a cottage with three bed-rooms on that floor generally exceeding the area actually required on the floor below. Such an arrangement as this may be desirable in some localities, but it is not contemplated in the instructions. This design is shown as roofed only with pantiles at a low pitch. The general plan of No. 29 is, upon the whole, good, but the elevation as shown cannot be commended, unless the improved elevations, as sketched in the alternative design, were adopted, which would then bring the cost considerably beyond the stated sum.

In fine we may observe that although good cottages may possibly be erected, under favourable circumstances, in some parts of England for a lower sum, we consider the probable average cost of a pair of cottages built with the conveniences we have enumerated would be about £280 to £300, and that the attempt to erect them at any considerable reduction upon this amount must result in some inferior kind of buildings, discreditable to the owner, and wanting in much of the necessary accommodation for a labourer and his family.

We would further remark, in conclusion, that there are other advantages besides the mere per centage on the outlay which must be looked for to remunerate a cottage builder for his expenditure on improved dwellings, advantages nevertheless capable of being estimated at a pecuniary value, such as proximity of the labourer to his work and consequent saving of time, &c., amounting often to quite as much cash value as half the rent of the cottage, but especially the moral and physical welfare of the tenants, and the proper sanitary condition of their dwellings. These latter considerations, after all, are those which give so great an importance to the subject, and which have prompted us to give especial attention and care in deciding what may at first sight seem but a simple matter.

We are, Gentlemen,

Yours obediently,

CHAS. FORSTER HAYWARD, Architect.
GEO. DINES, Builder.
JOHN CLUTTON, Land Agent.

The name of the successful competitor (No. 23) is Mr. John Birch, 51, Holywell-street, Westminster, to whom the Council have awarded Mr. Denton's prize of £25 and the Society's silver medal, in accordance with the recommendation of the Judges.

EXAMINATIONS.—GOVERNMENT APPOINTMENTS.

Mr. George M. Norris, of the City of London College, a Prizeman at the Society's Examinations last year, who was nominated by the Council to compete for an Assistant Clerkship in the Privy Council-office, has been successful in the Examination recently held by the Civil Service Commissioners, and will receive an appointment. The nomination was kindly placed at the disposal of the Council by Earl Granville.

Proceedings of the Society.

TWENTIETH ORDINARY MEETING.

Wednesday, May 4th, 1864; Admiral Sir Edward Belcher in the chair.

The following candidate was proposed for election as a member of the Society:—

Wilson, John Peter, 40, Addison-gardens North, Kensington, W.

The following candidates were balloted for and duly elected members of the Society :—

Gatliff, Charles, 19, Coleman street, E.C.
Heinrich, Johann, 36, Lower Kennington-lane, S.
Stokes, Charles, 65, Brook-street, Hanover-square, W.

The Paper read was—

ON THE TESTING OF CHAIN CABLES.

BY FREDERICK ARTHUR PAGET, ESQ., C.E.

It is, no doubt, generally known that a select committee of the House of Commons is now considering a bill for the compulsory testing of the chain cables and anchors of merchant vessels. This may be said to lend a passing interest to a question which, however, needs no chance help in calling for our attention.

Without entering into lengthy statistics, or calculating the number of times that the total length of all the chain cables in actual use would measure round the world, we should be scarcely mistaken in the supposition that in different parts of the globe there are, at this very moment, many hundreds of valuable lives, and thousands' worth of property, in each case dependent upon a single link of the hundred fathoms that make up the length of an average chain cable; for there are situations in which a ship is often placed wherein the cable must be literally the thread of life of the vessel. To the seamen of the present age, the iron cable, though of comparatively recent introduction, is a common everyday thing. Those of the last generation could remember the time when only hempen cables were in use. The naval men of that time were thus led to look upon chain cables as the most precious gift ever made in modern times to the mariner—to repeat the words of the late distinguished Captain Basil Hall.

Now, although we have been testing chain cables according to certain Admiralty regulations established ever since 1831, although the naval administrations of France, Russia, and other countries have exactly copied these regulations, and although Lloyd's have adopted the Admiralty test—which is somewhat more than the so-called "merchant" test—it is a remarkable fact that a difference of opinion with regard to almost every point connected with the use and testing of chain cables still exists amongst engineers and other men of science. This differing of doctors is very strikingly shown by the Blue Book report from the 1860 Select Committee of the House of Commons on anchors and chain cables for the merchant service. One witness states that 50 per cent. of the loss of life by shipwrecks are due to bad cables and anchors; another that very few wrecks occur through bad anchors and cables. One objects to the Navy proof as being to high; another as too low. One witness considers that the cross-stay does not add to the strength of the link; another that the cross-stay is a great improvement. In the same way, directly contrary opinions were elicited from different witnesses with regard to the duration of cables under wear, their re-testing, re-annealing, and other points. A similar want of agreement on these matters exists in France; and it would thus appear that several interesting engineering questions, connected with the strength, the testing, and the re-testing of chain cables, offer a fair field for a practical examination.

According to the Admiralty regulations, an iron chain cable has to consist of eight lengths, each 12½ fathoms long, including one swivel in the middle of every other length, and one joining shackle to each length. Neglecting the swivels and shackles, each link may be described as a cylinder, the axis of which is wound into a shape approximating to that of an ellipse. The width over all, or across the minor axis, is made 3½ diameters (full) of the cylindrical bar. The length over all, or across the major axis of the supposed ellipse, is six diameters. The cast-iron stud across the minor axis is made 0·6 of a diameter in the centre, and one diameter at each of its ends. This stud not merely acts as a cross-stay, but also preserves the freedom of the joints, or what may be termed the mechanical flexibility of the cable. The weights are of course exactly fixed in the government tenders. The weight of, for instance, a one-inch link stay-pin must not exceed 3½ ounces, and the weight, fixed by contract, of a hundred fathoms of cable, in 8 lengths, including 4 swivels and 8 joining shackles, must not be exceeded by more than 1-20th part. The experience of many centuries has determined the sizes of hempen cables for ships of a given tonnage; and, the sizes of the hempen cable being thus given, it is easy to substitute a chain cable of the required strength. Mr. J. R. Napier has proposed a formula, according to which one-eighth of the cube root of load displacement would give the diameter of the chain cable usually employed by steamers of the present form. In the Admiralty comparative table, showing the weights and strengths of stud chains and hempen cables, there is a noticeable relation between the girths of the hempen cables and the diameters of the iron employed in chain cables. The number of inches of the circumferences of the hempen cables pretty nearly expresses in lines, or twelfths of an inch, the diameters of the iron cables of equal breaking strength. The material of the links is No. 3 rolled bar, and very good cable bolts generally cost from £1 to £2 above common bars. According to experiments by Telford, Hodgkinson, Mr. Edwin Clark, and Mr. Kirkaldy, and also according to numerous experiments at Woolwich, we may safely take the ultimate breaking strength of cable bars at 24 tons to the square inch, and their limit of elasticity, under a tensile stress, at 12 tons to the square inch. These bars would stand a pressure up to deformation of 18 tons to the square inch, and 15 tons pressure at the elastic limit. The ultimate tensile strength of a round bar of this iron would thus be nearly 19 tons. According to the evidence of the leading man of the test house at Woolwich, in 1860, this ultimate statical breaking strength is only occasionally exceeded, when it rises up to about 20 tons for a one-inch round bar, or 25·33 tons per square inch. He also stated that a great number of experiments, made at Woolwich, showed the greatest breaking strength of one-inch chain cables to be only 28·31 tons. Contrary to the popular assumption that a stud link should be, in the direction of its length, twice the strength of a single bar, this result would show a loss in strength of 28·75 per cent. According to the comparative table published by the Admiralty, the one-inch bolts should stand 21 tons 8 cwts., and the stud link therefrom, 34 tons 5 cwts. It also appears to have been assumed (for it could scarcely have been proved by experiment) that the strength of the cable bolt, and of the link therefrom, both increase almost exactly in the ratio of the diameter of the bars. Thus, the breaking of two-inch bolts is given as 21 tons 8 cwts., $\times$ 4 $=$ 85 tons 12 cwts., to which two tons are added; the strength of chain therefrom as 34t. 5 cwt. $\times$ 4 $=$ 137 tons, and the proof as 18 $\times$ 4 $=$ 72 tons. It is, however, well known to engineers that, as a rule, a two-inch bar is not practically four times as strong as a one-inch bar of even exactly the same make and by the same maker, and that the strength becomes less and less as the bulk still further increases. The proportions adopted by the Admiralty appear, however, to compensate for this loss, and there is very nearly the same average ratio of breaking strength to diameter in all chains from five-eighths to two inches. But, even according to the Admiralty tables, there is a remarkable amount of strength lost in forming the iron into the link. This loss of strength was well known to Sir Samuel Brown, the introducer of chain cables. He thus patented, in 1817, the straight link used in suspension bridges, and first applied it to the Brighton chain pier.

There are several reasons why a portion of the strength of the bar should be lost in forming it into a cable link. The principal causes are :—1st. The mechanical shape of the link; 2nd. The crushing stress undergone by the insides of the crowns; 3rd. The deterioration in strength of the iron through its being bent; 4th. The loss of strength at the welds.

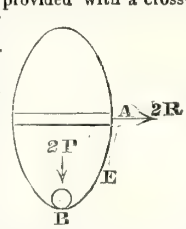
In the first place, each link is, when the cable is pulled in the direction of its length, subjected to a transverse strain at each of its ends or crowns, and is somewhat in the condition of a curved beam loaded in the middle. An originally curved beam is, with regard to bending stress, in the same condition, at any cross-section at right angles to its neutral surface, as a straight beam under the same moment of flexure. The moment of flexure of one end of a common unstayed link can be expressed in inch-pounds by multiplying half the span, or half the distance in the clear, by the load in pounds. In the case of the stayed link, however, the moment of thrust of the cross-stay has to be subtracted from the moment of the bending force. The mechanically weakest part of any link is thus at the crowns.* Now, it is a curious fact, that all the writers on the strength of materials, from Professor Peter Barlow, Mr. Edwin Clark, and others, down to General Morin, in 1862, give the strength of a link furnished with a cross-stay to be equal to that of the iron of which the link is made.

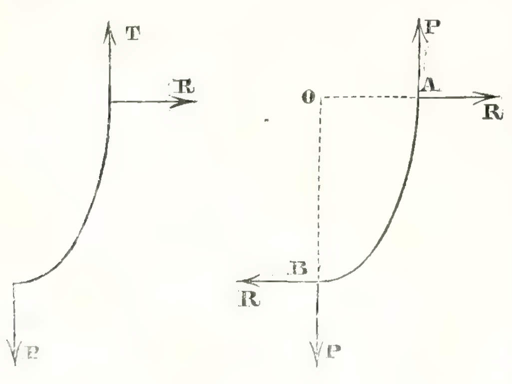
In a mathematical sense, the contact between the links is only at a point, because it is a case of two cylinders touching each other at right angles. Under a load, this point will spread out to a surface of an area given by the amount of the load and by the compressibility of the iron. This surface will then probably increase, in the case of a one-inch cable under a load of nine tons, up to more than half a square inch. And thus at the ends, the softer and more ductile the iron, the sooner will it be worn away in practice, and the progressive deterioration caused by this crushing action will also be furthered by the friction.

An attempt to account for the reduction in strength through the bending of the cylindrical bar has next to be made. Wrought iron is known to be a crystallized body, belonging to the cubic system. Now Mr. Mallet, in his important work "On the Physical Conditions involved in the construction of Artillery," has shown that these crystals are not grouped amorphously (or without distinct arrangement); but that they always take a certain determinate position. He has developed the law that "iron, whether in the state of cast or of wrought iron, has the principal axes of its integrant crystals arranged in the lines of least pressure within the mass" while exposed to pressure and heat in progress of manufacture. The principal axes of the crystals in a rolled bar would thus be set in a direction coincident with the length of the bar, and, from the property of malleability possessed by these metallic crystals, they would further take, under the pressure of the rolls, or the impact of the forging hammer, the longitudinal extension known as the "fibre" of wrought iron. Mr. Edwin Clark found that bars cut longitudinally and transversely to the fibre of the same plate of an excellent quality of iron, gave with the fibre a strength of from 19·66 to 20·2, and across the fibre a strength of only 16·7 tons to 16·93 tons. The ultimate elongation also of the plate in the line of the fibre was double as great as transverse to it. A great number of experiments by Mr. Kirkaldy gave somewhat similar results. He found that the difference averaged from 21·7 to 2·1 per cent., the mean difference in the whole being 9·8 per cent. in favour of the direction of the fibre. The respective ultimate elongations were also in almost the same rates as those found by Mr. Clark. It would thus appear from these experiments, and from a consideration of Mr. Mallet's law, that both the elastic range and breaking strength of wrought iron of any given quality are, to a certain amount, dependent on the direction of the crystalline axes in relation to the strain; and further, the elasticity would be at a maximum in the direction of the principal axes of the crystals, or "line of fibre." The crystals in a bar subjected in the direction of its longitudinal axis to a tensile or a compressive stress, would thus be in the most favourable condition with regard to its ultimate breaking strength and its elastic limit. But when, say, a red-hot bar is being bent, the principal axes of its crystals would, according to the law of cross-bending strains, arrange themselves above and below a neutral axis in the direction of least pressure within the mass; the neutral axis would probably pass through the centre of gravity of the bar, the fibres on the concave side would be compressed, and those on the curved side would elongate in the ratio of their distances from the neutral axis. The hot iron itself would be, at any rate on the concave side, under a somewhat similar influence as when passing through the last pair of rolls, but the directions of least pressure, instead of being coincident with the length of the bar, would be at right angles to tangents to the neutral axis. Much of this is, of course, founded on several unproved assumptions, but it is at any rate evident that the molecular arrangement of the iron at the crown of the link is in the worst condition for resisting the tensile and compressive strains on each side of a neutral axis that make up the compound action of a transverse stress. The late Professor Daniell's process for unmasking the fracture and the arrangement of the fibre of wrought iron, by immersing the piece in dilute hydrochloric acid, would doubtless reveal a distortion of the crystals round a neutral axis.

It would thus appear that the crown of the link is its weakest part. This is, however, very far from being practically the case. Each link has of course to be welded up, and the weld is in one of the sides, with a long scarf, in order to get a large welding surface. When we recollect that there are, in round numbers, 1,800 links, and, consequently, 1,800 welds, in a one-inch hundred-fathom chain cable, and also that the efficiency of the cable depends on each individual link, the paramount importance of the welds is obvious. In nine cases out of ten, while in use and while being tested, the links are found to give way at the sides. Breakages would, *cœteris paribus*, have a tendency to occur at the welds with good iron but bad

* For the sake of simplicity, let us suppose the cross-sectional area of the link as infinitely small compared with its major and minor axes, and suppose it provided with a cross-stay. Let 2P denote the whole pulling force; 2R the thrust of the stay; T the tension at A. For the equilibrium of the quarter link, B E A, we have the forces P, R, T, and the forces at B arising from the left-hand quarter at A. From symmetry this must be horizontal (in the figure), and we must therefore have:—Force at B = R, and T = P. The moment of the bending force at B is therefore not P × oA, but only P × oA − R × oB. On the other hand, when the link is on the point of breaking by opening at B, the tension will not be equal to the ultimate tension throughout the section at B, but only at the lowest point, and when this ha given way a little, the tension, previously supported, is thrown on a fibre higher up, which then gives way, and so on. Hence the strength is less than if the tension were throughout the section as great as possible.





workmanship, and in the iron, and not in the weld, if good workmanship but bad iron were employed. The uncertainty of welds is in any case well known to practical men. Mr. Kirkaldy has made some eighteen experiments on the relative strengths of welded joints in wrought iron. Some of these welds were made by a chain-maker. Only six of the specimens broke solid away from the weld, and in every case there was a loss of ultimate breaking strength averaging from 2·6 to 43 per cent., the mean being nearly 20 per cent. As with almost everything else belonging to the subject of chain cables, one of the witnesses before the Committee of 1860 raised the question whether the position at one of the sides was the best for the weld. Mr. Smale, of Woolwich, proposed to weld the link at the crown, as there would thus be more room for the smith, and any bad weld would be less hidden by the cross-stay. The crown is, however, as we have seen, *ab initio*, the weakest part of the link. Besides, if a weld at the side gave way, the other half might catch and save the cable; at the same time, however, a sudden giving way at the weld would cause an instantaneous distortion and probable rupture of the opposite side, as the sudden "run" of the cable would act with an impulsive force. In fact, when iron cables were first introduced, the welds were made at the crown, but the plan had to be given up. It is clear enough that there are, *cœteris paribus*, three weak places in a link where any effects of stress would first show themselves,—the two crowns and the weld at the side.

We thus see what a powerful element of uncertainty is brought by the uncertainties of workmanship into such an apparently simple thing as a chain cable. When, however, we remember that the very best wrought-iron of commerce is, to use the words of the well-known metallurgist Saint-Claire Deville, but a metallic sponge, like platinum, the pores of which have been simply closed up by pressure or percussion; that, in one word, ordinary wrought-iron has never, as wrought-iron, been fused, it will be seen that the uncertainties qualifying the material itself are still greater. Mr. Mallet thus found that while the original hammered slab of a very large forged mass had a breaking strength of 24 tons to the square inch, it fell progressively to 17 and 16 tons at the different places of the mass, down to even as low as 6½ tons in some parts. Unless this iron had been burnt, its tenacity could doubtless have been restored, and if drawn into wire, its breaking weight might have been increased to perhaps ninety tons to the square inch—at least before annealing. An average of 188 experiments, made by Mr. Kirkaldy on rolled bars, gave a maximum breaking strength of 30¾ tons, and a minimum of nearly 20 tons to the square inch. These influences of the manufacture merely on the quality of wrought iron are almost independent of the chemical constitution of any individual bar. For instance, until it be proved to the contrary, there are many reasons for the general belief that the cold shortness of wrought iron is due to the presence of silicon and carbon; and its hot shortness to that of sulphur. A fractional percentage of copper also makes wrought iron hot-short. In truth, there are probably no two bars or parts of a bar of an exactly similar chemical composition, or in an exactly similar state of molecular aggregation, and therefore of an exactly similar breaking strength or elastic limit. Even these are only a few of the elements of uncertainty in structural materials. But when we further take into account the varied strains of extension, compression, distortion, twisting, and bending, to which mechanical structures are more or less subject; that the work done by a gradually applied load is doubled if this load be applied suddenly; that the impulsive strain of a moving load is generally more or less intensified by vibration; and that the varied shapes and arrangements intended to receive these strains must be often as much fixed by financial as by scientific considerations, then the reason that the best engineering practice makes the ultimate strength of a wrought-iron structure from four to six times the working load must be even popularly evident. But these factors of safety are not sufficient. The structure must be tested as searchingly, and as far as is consistent with safety—as far as is possible without injuring the material and its relation to the structure. In our case this limit is, in the main, given by the limit of elasticity of wrought-iron under extension, as this limit is less for wrought-iron than that of compression. It is also self-evident that the mode of testing adopted ought to approximate as nearly as practicable with the kind of stress the object is intended to undergo in practice. It is also evident that if circumstances allow us to exceed this limit, if, in fact, we can push the test as far as the breaking strength of a portion, or of an individual piece of the object, we shall obtain the safest amount of information about its qualities. In this way guns and plates are both tested to destruction. In order to test the probable performance of rails under a moving load, a certain number, taken from a lot, are broken by a falling weight, the distance between the supports and the height of fall being fixed by contract. The French test their railway carriage axles in a somewhat similar manner. There is no test so good as a blow for detecting a false weld. In Sweden they do not confine themselves to the usual gunpowder proof for gun barrels, but two or three sharp taps with a hammer are given along the breech, which have an immediate effect on a bad weld. All the whipple chains for the carriages of the Royal Swedish Artillery are tested by letting the loose end fall from a height double the length of the chain, after being attached to a weight. The anchors for the French imperial marine are tested by being dropped from a determined height for each size. The axles for the carriages of the Messageries Générales and the Imperial Artillery are tested by the impact of a falling weight. All the swords and sabres for the army are tested by striking the blades on a block of wood. When we advance from details to considerable structures, we are, of course, obliged to very carefully confine ourselves within the limits of elasticity. After loading a railway bridge with the greatest passive, or perhaps impulsive load that would ever come upon it in practice, the deflection, and the permanent set, if any, are both carefully noted. As a boiler is subjected in practice to a complex train of mechanical and chemical forces that are always striving to break their bonds, its ultimate strength is made from six to eight times the working stress, and it ought to be periodically tested to half its working pressure. Its extension under this pressure is sometimes—and should always be,—measured by the volume of water that is pumped in by pressure after the boiler has been filled; while the permanent set is determined by the difference between the volume pressed out by the contraction of the boiler when the pressure is withdrawn, and the volume of the water that remains in the boiler after the test—allowance being of course made for any slight leakages and sweating at the joints. In first-class locomotive works the deflexion and permanent set of the steel springs are always tested in an apparatus for the purpose. It may here be remarked that, although the designs of all the successful wrought iron structures ever built have been based on the assumption of a limit of elasticity, nevertheless the relation of the permanent set of wrought iron to its ultimate resistance under a given load, is still a subject of some discussion. We have, on the one hand, the testimony of Professor Eaton Hodgkinson, who says that "the maxim of loading bodies within the elastic limit has no foundation in nature;" and, on the other hand, some appear to believe that iron is even improved by breaking it under, at least, a tensile stress. Mr. Hodgkinson found that a rod, 10 feet long and of one square inch section, took a permanent set of 0·0005 of an inch under a static load of less than 1¾ tons. Mr. Edwin Clark obtained very similar results. Such a microscopic set, however, could be referred to the elongation caused by the heat generated by the internal friction of the particles, or to the probable fact that these bars were also new; and it is conceivable that they might have taken a slight permanent set, just as new ropes take a permanent set, without injury, when

the strain is first applied. There are, indeed, very few forms of wrought iron in which its internal particles are not, *ab initio*, subject to some mutual strain. At any rate, these elongations were very slight, and increased uniformly up to tensions varying from about 10 to 15 or 16 tons on the square inch. Beyond these strains the bars elongated in an irregular manner, until they at last broke. At the same time, as Dr. Rankine remarks, the demonstration by Mr. E. Hodgkinson that a set is produced by a strain much less than what would injure the specimen, renders the determination of the proof-strength a matter of some obscurity; but Dr. Rankine points out that the best test now known is the not producing an increasing set by the repeated application of a load. Some years ago, Mr. Loyd, of Woolwich, made certain experiments which have been cited as proving that a breaking strain does not injure iron, even when this strain is four times repeated; or rather, that after breaking a bar into, say, two pieces, the two pieces are thereby made stronger. In, for instance, experiment 2, the $1\frac{5}{8}$ bar marked C was found to break with $33\frac{3}{4}$ tons, with a stretch of $9\frac{1}{4}$ inches in 54 inches; a piece of this bar then broke at $35\frac{1}{4}$ tons, with a stretch of only a quarter of an inch in 36 inches; another piece of the bar, 24 inches long, was broken at 37 tons, with a stretch of one inch; and at the fourth and last breakage was found to give way at $38\frac{3}{4}$ tons, but without any stretch at all. Results of a similarly delusive kind, obtained by Professor Walter Johnson, were communicated by him to the United States government in 1845. He found that by heating a bar to a temperature of 400° Fahrenheit (or the temperature of steam at about 250 lbs. pressure), and stretching it permanently for about $6\frac{1}{2}$ per cent. of its length, it, on being broken, gave an ultimate breaking strength about 20 per cent. higher than a portion of the bar that had not been heated and stretched. He therefore supposed that, to use his own words, "the value for useful purposes, added to a bar of iron by thermo-tension, when the increase of both length and tenacity is taken into account, may be safely set down at 26 per cent. of its original value. It sometimes exceeds 30 per cent. On a single cable, 100 fathoms long, made of iron $2\frac{1}{2}$ inches in diameter, weighing about 15 tons, and attached to a line-of-battle ship, the gain, in true commercial value, would not probably fall short of 600 dollars." A machine was made by the American government, in order that the Professor might apply his principle of "thermo-tension" directly to chain cables, but as nothing else ever appears to have been heard about the matter, we have thus, as usual, lost another of the lessons always taught by scientific accounts of scientific failures. The pitch chains of the old engines of the *Great Britain* are stated, by Mr. Guppy, to have been stretched one-eighth of an inch while at a low red heat. This was, no doubt, an excellent method for testing the soundness of the work. Captain Blakely also stretches the hoops that are shrunk on his guns. This is done on a maundrel, and while the rings are at a red heat; but it is stated that only one-sixth of the breaking strain of the cold metal is applied. The action of the maundrel also probably rearranges the crystalline aggregation which had been disturbed by bending the ring from a straight slab. The red heat of iron is only visible in daylight at a temperature of 1,077 degrees Fahr., and the heat used by Professor Johnson was only from 400 to 500 degrees. But the "gain of length"—the permanent set, in fact—of from 5 to nearly 7 per cent., sufficiently shows that the bars had either been broken or were close upon fracture. His results, in fact, merely anticipated those of Mr. Loyd. The breaking strength of his bars was doubtless increased, but with a proportionate diminution, perhaps, indeed, a complete destruction, of their elasticity. They were rendered harder, for what is the hardness of a body but the resistance of its particles to any temporary readjustment? The longitudinal elongation was accompanied by a lateral contraction of the cross-sectional area that would reach its culminating point at the part where fracture happened to take place. Exactly the same argument, founded on similar experiments on cables themselves, was used before the 1860 Committee, in order to prove that cables are not injured by a breaking strain; but a mere statement of the progressive diminution of the elongations would have detected the fallacy.

The apparent increase of ultimate strength through successive breakages, thermo-tension, and much of the high static breaking strength acquired through cold rolling, and cold hammering, even through wire-drawing previous to annealing, are referable to an increase of hardness, to an increase of the difficulty of the gliding to and fro, to a resistance to the inter-mobility of the particles, to, in one word, a diminution of elasticity. If the numerous experiments that have now been made on iron do prove anything, it is that the breaking strength does not indicate the quality—the breaking strength must be taken conjointly with the elongation. The true measure of the mechanical value of wrought iron is simply the sum of the products of the successive loads and the increments of elongation—in other words, the resilience of the bar or the deflection of the beam, or the work performed in producing the stretch or deflection. We thus see the value of Poncelet's symbols T_e and T_r, advocated with such ability in England by Mr. Mallet. Upon the just balance of strength of fibre, or high breaking strength, and extensibility or ductility, depends the mechanical or structural value of iron.

The Navy test for chain cables is stated to be the result of a number of careful experiments by the late Sir Samuel Brown, and it was adopted by the Admiralty in 1831, when chain cables were fairly established in the royal service. The test adopted by the French Navy is almost exactly the same, and in Russia and the States it is exactly the same, as both those countries use our own measures and weights. Every chain cable is proved by a gradually applied stress of 630 lbs. for each circular one-eighth of an inch of the area of the bolt of which the cable is made, or 11·46 tons to the square inch on each side of the link.

Assuming that a link is subjected in practice to a tensile stress, and as the proof strength is generally fixed at double the working stress, this would correspond to nearly $5\frac{3}{4}$ tons on the square inch. There is thus a very close correspondence between the working stress assumed for chain cables and the Board of Trade limit of 5 tons to the square inch, imposed about 16 years ago, for both the tension and compression of the wrought-iron of railway structures. The chain cable of a ship is also evidently subjected to impulsive forces. It is true that a ship, when struck by a sea, in most cases merely lifts the weight of her chain, the catenary curve of which thus acts as a kind of water-brake; but a very heavy sea must occasionally bring a sudden pull on the cable, and in shoal water the sudden strain must be almost solely taken up by the resilience of the cable, or rather by the deflection of the series of beams composing the cables. Much security is, however, afforded by the fact that a cable is generally only strained during a brief interval of time. But few cables can stand a sudden nip at the hawse-pipe; and we thus see that lateral as well as longitudinal strength is occasionally required in a cable.

If two one-inch diameter cable bars of average quality, and, say, each ten feet long, be put into the hydraulic press generally used for testing cables, the following appearances will probably be observed:—If new, they will take a very slight set under a stress of about $1\frac{1}{4}$ ton to the square inch, but if this stress be gradually increased, and alternately eased off and put on several times, the set will not increase until the true elastic limit or proof strength of the material be exceeded. In our case this limit will probably be 12 tons to the square inch, which is thus higher by a little more than half-a-ton than the 11·46 tons navy test. At the Admiralty proof stress, each of the bars will have a probably total elongation of more than one-twentieth of an inch, and a permanent set of six-thousandths. Beyond this strain the set will very rapidly increase up to, perhaps,

two inches, when the bars will break under a load of 24 tons to the square inch. But the phenomenon the most important in its consequences, consists in the contraction of cross sectional area undergone by the bar through the stretch. According to a theoretical investigation by Poisson, the relation of the contractions to the longitudinal elongation should be $\frac{1}{4}$; and Wertheim's experiments led him to believe that this relation should be $\frac{1}{3}$. Cauchy, Stokes, Maxwell, Rankine, and Lamé, have also mathematically investigated this question, and have arrived at results differing from those of Poisson, which were founded on a special atomic hypothesis. But the permanent sets that show themselves in ductile bodies, like annealed iron, under very slight loads, and the so-called internal frictions observed by Dr. William Thomson in metals under tension, would cause this relation of contraction to elongation to differ for every different state of a metal. To Kirchhoff is due a remarkably important investigation carried out in 1859, into the relation of the contraction to elongation under tension of hard steel wires—which may be said to approach the nearest to the ideal of a body possessing equal elasticity in different directions. His experiments, conducted with great delicacy, gave a relation of cross sectional contraction to elongation of 0·294. As we have seen, according to the Admiralty tables, a one-inch cable bolt ought to have an ultimate breaking strength of not less than 21 tons 8 cwts. to the circular inch, or more than 27 tons to the square inch, and the link ought only to break at 34 tons. It is, however, very seldom that these strengths are obtained in practice. The ultimate elongations of the bars or the cables are not stated in the Admiralty tables. General Morin relates that the fine charcoal iron, made at Gueriguy by the French government, expressly for chain cables, sometimes elongates even more than one-fifth of its original length before breaking, and this amount is probably the utmost that it is possible to give to wrought iron bars.

When the cable itself is placed under the dead pull of the press, it is tested in three different ways. It is first strained up to 11·46 tons in the square inch sectional area across the double section of the link. While for about three or four minutes under this stress, the cable is subjected at different parts of its length to blows from a round-faced hammer. Different sized hammers are adopted in proportion to the size of the chain, and each fathom generally receives one blow. Each link is then carefully examined. Two or three links are broken up to detect, by its bluish tinge, if the iron has been at all burnt in the working, and also to make some estimate of the quality of the iron from the surface of the fracture, and the other appearances known to engineers. Some difference of opinion also exists, both in France and in England, as to the amount of security afforded by these tests, and whether the test of 11·46 tons on the square inch, and more especially the blows of the sledge, do or do not injure the cable. In 1855 it was attempted to introduce a compulsory government test in France for the chain cables of merchant vessels. A letter was addressed by M. David, an influential chain cable manufacturer at Hâvre, to the then imperial minister of public works, advocating a compulsory test, from motives of humanity to the ships' crews, and of public economy. A system of periodical re-testing, for every ten or twelve years that the cable had been at work, was also proposed. The attention of the then minister of the French marine was directed to the statements put forth, and Admiral Hamelin ordered an official investigation of the question. The results shown forth in the report would appear to have proved—at any rate to the satisfaction of the Imperial administration, that —1st. "The proof test of 17 kilogrammes, or even of 20 to 21 kilogrammes per square millimetre of section of the link, is not enough either to prove the good workmanship of the cables or the quality of the iron employed; 2nd. That a higher proof than 20 to 21 kilogrammes cannot be applied several times to cables without affecting their quality; 3rd. That the differences of useful effect between different presses often lead to error with respect to the absolute value of the tension employed. . . . . The sum total of these results therefore shows, continues the minister, that, on the one hand, an increase of the proof test would not be of much effect in detecting bad material and workmanship, and on the other, that it would be dangerous to increase the test. The required security can only be obtained in a well-understood system of manufacture; and therefore, besides the test in the press, it is necessary to scrupulously choose the special quality of iron required; to accurately examine each individual link after the testing; to break up any questionable link; and to choose the most skilful and trustworthy operatives." In one word, the minister of the marine did not consider a government inspection of chain cables intended for the French merchant service as a practicable thing. It is to be remembered that all the chain cables for the Imperial navy are manufactured by the government.

Now there can be no doubt that the proof of 11·46 tons to the square inch is not enough of itself to test the quality of the workmanship, or, more definitely, the perfection of the welds. For this reason Mr. R. Bowman advocated before the 1860 Committee an increase of the test. It is clear that, as the sides are only tested up to little more than 11·46 tons, and as they would break at only, say, 24 tons to the square inch, less than one-half the sectional area of the iron would stand the test if applied only tensionally. As, however, through the cross-bending strain at the two ends, the link slightly tends to assume the shape of a lozenge, the weld is more severely tested than would at first appear. There is a certain difficulty in detecting a bad weld, upon the nature of which some practical light has been thrown by some experiments of Mr. Kirkaldy's on bars grooved round their circumferences. The matter had been previously investigated by the writers on elasticity, but Mr. Kirkaldy was the first to practically test the question. Bars grooved at any particular part down to a given diameter, gave a much higher ultimate breaking strength than bars of a diameter all through equal to that at the reduced part of the grooved bar. The wider parts on each side resisted the tendency to draw out, and a great apparent strength was thus obtained. The extent of this apparent gain was as much as 37½ per cent. in some of the pieces, while the average gave 18·63 per cent. in favour of the grooved specimen. Here again we see the falsity of taking merely the breaking strength into account, for although the breaking strengths were thus increased, the elongation, and the contraction of area attendant on elongation, were proportionately less. It will thus be seen that a bad weld may be impaired by a strain in excess of the elastic limit due to the quality of the iron and the cross sectional area of the solid metal, and that, although it is thus injured, it may not show signs of the injury. On the other hand, some security is given that a bad weld may be detected, from the fact that rolled iron is well known to be somewhat hardened by being hammered, and the welded-up side of the link would thus be less extensible than the opposite parallel side, and would thereby be rather more strained. It is evident, however, that though the test can scarcely be too high for the welds alone, the proof of more than fourteen tons to the square inch, proposed by M. David, would clearly be too high for the cable. M. David, indeed, stated that he tested his cables up to this amount, but it appears that the pressure he used was not accurately measured. Indeed, there is no doubt that very few cables would stand the ordinary proof if repeated sufficiently often, or if it were put on and eased off a succession of times, upon the plan shown by Dr. Rankine. As it is, the permanent set taken by cables is, on an average, from 4 to 6 feet in 90. But the best proof that this single application of the test for a short time does not injure good chain cables, is seen in the fact that it has been adopted all over the world for more than thirty years. We are, however, in a dilemma. To increase the proof would evidently be to in-

jure the link, while the detection of a bad weld has, in any case, to encounter the difficulties just mentioned. These questions can only be met by a most careful inspection of each individual link. The quality of the iron can also be very closely tested by breaking up two or three links. The most searching tests, however, are the hammer blows given while the chain is under tension. Adapting a well-known and excellent illustration, this will be at once evident when we remember that a $1\frac{3}{4}$-inch chain cable, made of glass, would give the same ultimate gradually-applied breaking strength as a one-inch iron cable—but it would not be likely to stand the hammer test. On the other hand, a cable of india-rubber, although not to be broken by the hammer, would at last be torn in two by the press. In fact, the hammer test approaches nearer than any other to the kind of work that will have to be done by the cable when at sea. Besides, the mere form of a chain renders it, *per se*, liable to continual shocks and jerks, and this must be encountered by a special quality of material, and that this material has really been used must be shown in the proving house.

Mr. Pope, the surveyor for Lloyd's at Liverpool, gave it as his opinion, before the Committee of 1860, that the navy test was too high, and had a tendency to injure the chain. This might be true for a chain of a bad material, but not for a chain made of iron with the high elastic limit that should alone be used for chain cables. He proposed to test a short piece to destruction, and then to test the entire chain up to half the Admiralty proof. Apart from the expense and destruction of material by this proceeding, there can be little doubt that half the usual test would not detect all the bad welds, and the distinctive peculiarity of a cable consists in the fact that a single bad weld is sufficient to cause the entire loss of the chain.

As we have seen that a cable consists substantially of a series of small curved beams, it would be only a natural inquiry to ask why the sum total of their deflections, represented by the temporary elongation of the cable, and why the total permanent set should not be both registered, and be both taken into account when estimating the quality of a cable. There are, however, several influences that would greatly disturb an accurate deduction. It might, at first sight, be supposed that the defective welds would elongate in the inverse ratio of their areas of solid metal to that of the links. This, as we have seen, is not the case, and even if it were the case, the action would affect the deductions therefrom by variable and uncertain quantities. The links will also bed against each other to an amount given by the hardness of the iron. There can be no doubt that the extension must be taken into account with the breaking weight, when the quality of a bar has to be estimated. But even with bars this varies considerably, not merely in different qualities, but also, as was shown by Mr. Kirkaldy, in specimens of the very same brand. These results were also obtained under tensional stresses alone, and when we come to the combination of transverse, tensile, and directly compressive stresses to be found acting on a link, the varied ways in which these stresses act on varying qualities of iron would scarcely render the deductions from the elongations and set sufficiently trustworthy. Again, to take an extreme case, if one half of, say, 50 fathoms of cable were made of a very bad kind of iron, and the other half of a very good quality, it would be difficult to draw any right deduction from these appearances. As it is, however, the permanent set is generally registered.

There is probably no metal the strength of which is influenced in such a remarkable way by temperature as iron. As M. Baudrimont showed in 1850, the tenacity of iron is less at 100° C. than at 0° C., but at 200° it is greater than at 0°, and these results have been exactly confirmed by Dr. Fairbairn in some experiments on boiler plates, communicated in a paper to the British Association. At yet higher temperatures this tenacity is of course diminished; and Seguin has shown that iron, the tensile strength of which could be represented by 100 at 10° C., had this tenacity lowered to 90·5 at 370° C., and to 58·7 at 500° C. In the royal dockyards of Woolwich and Portsmouth the atmospheric temperature during the testing of each anchor or chain is carefully noted, although the proving houses themselves are kept at a mean temperature of 56° Fahr. by means of stoves, which also thus save the water pipes from freezing. This temperature of course falls a little during the winter and rises in summer, as the heat in the shade generally varies in England from about 76° to perhaps 34° Fahr. The action of frost on iron has not been completely investigated; and Dr. Percy recommends that some accurate experiments on the question be undertaken by the Institution of Civil Engineers. The daily observation of practical men has, however, as in so many other cases, preceded the deeper investigations of science. All workmen know that their tools, such as picks and chipping hammers, which have to undergo percussion in frosty weather, are then more liable to get broken. All chains are well known to be more subject to snap under the same circumstances. There is always a notorious increase of accidents through breakages, both in the permanent way and rolling stock, of railways during frosty weather. It is stated that during the severe winter of 1860–61, 498 rails were broken on the Chemin de Fer de l'Est, from the 11th December to the 31st January inclusive. No less than 258 were broken from the 21st to the 25th of January, during which period the thermometer descended to −7·8°, and even to −16° centigrade. General Morin relates that during the northern campaigns of the first empire the artillery veterans used to believe that wrought-iron was subject to freezing, and after the long winter bivouacs they never began their day's march without striking the gun-carriage axles in the direction of their length, and the vibration thus produced was said to "thaw" the iron. An intense cold is also said to have enabled the French garrison of Hamburg to disable the cast-iron siege guns, by knocking off the trunnions before evacuating the place. Mr. Lenox stated, in evidence before the 1860 Committee, his belief that a cable would stand a test in warm weather that it might not in cold. The crews of the fishing vessels on the coast of Nova Scotia find that the cold renders their cables so brittle that a length of hempen cable is used for the portion out of the water, while the anchor end is kept from the vicissitudes of the atmosphere by the usual average temperature of the sea. A few experiments made by Mr. Kirkaldy showed that the breaking strength of a bar is slightly reduced by freezing when a gradual breaking load was applied, but that this difference between a frozen and an unfrozen bolt is much more increased by a suddenly applied load, being 3 per cent. less when frozen. The usual way adopted by French engineers to test rails is, as we have seen, to prove a percentage of the lot by means of a falling weight. Some tests were carried out a few years ago by M. Couche, on a number of rails, of very good quality, from the Anzin works. The monkey weighed 300 kilogrammes, and the distance between the supports was 1m. 10. When the thermometer varied from − 4° C. down to − 6° C. the weight had only to be raised, in an average of twelve experiments, to a height of 5ft 6in. in order to break the rail; but when the thermometer rose from + 3° to + 8° C., then the weight had to be lifted for a fall of 7ft 9in. Similar experiments, conducted in 1860, showed that a difference of temperature from − 4° to + 5° Centigrade was sufficient to greatly influence the height of fall necessary to break the rail. It is not unnatural to suppose that the particles of iron, after being worked at a heat and allowed to cool and set at a medium temperature, should, when that temperature is lowered, get into a state of mutual strain; or that any initial mutual strain should be thus intensified. The toys made of suddenly cooled glass, known as Prince Rupert's drops, are exaggerated instances of a similar action. The outside portions of a bar of whatever size, would evidently cool and consequently contract first of all. The inside portions would also at last cool, but, having kept the out-

side portions distended, when the inside does cool, it then becomes a question, to be determined by various circumstances, whether it would pull the outside shell into a state of compression, or whether the outside shell would draw the inside into fissures by tension. A somewhat similar explanation is given by Mr. Mallet of the rents caused in the interior of very massive forgings, and this state is probably always induced by the conditions of cooling in a small bar, but with, of course, a smaller range both as to size and temperature. In any case, it is apparent that a ductile, elastic material ought to be less affected by these doubtlessly complicated conditions of tensile and compressive strains. It is, therefore, probable that a hard, harsh, iron would be more affected by frost than a soft ductile iron, and also that the breaking strength of both qualities would be less affected by cold than their extensibility. It is even by no means improbable, though the fact would be difficult, or at any rate very expensive, to prove, that the breaking weight, or the elastic limit, or both, of iron, is or are different for every degree of heat. A bar is perhaps cooled down in the rolling shed the medium atmospheric temperature of, say, 52° Fahr. At a lower temperature, at a temperature, for instance, of 32° F., its static breaking weight is increased, but its power of elongation under stress is probably diminished. At, say, boiling point, its breaking strength is diminished, but its power of elongation is increased. These remarks to some extent meet the results of Baudriment and Fairbairn. Unfortunately, Baudriment has not recorded the elongations, and his experiments were made on wires only one millimetre in diameter when at a temperature of 16° C. Dr. Fairbairn did find that the elongations of plates increased very closely with the temperature, but his experiments are not sufficient in number to be taken as conclusive; and, as Dr. Percy remarks, many more experiments are required on the action of frost on iron. If it could be shown, for instance, that the crystals of iron expand to different degrees in their different axes, this would probably, *per se*, meet the scarcely-to-be-doubted fact that iron is rendered brittle by frost. As the chain cables of a ship are alternately exposed to the utmost extremes of atmospheric temperature, this question is here of peculiar importance.

The question as to the re-testing of cables that have been in use for a certain time is yet unsettled, but the inquiry is of scarcely less importance than that of the first testing. There are many applications of wrought iron in which it is subjected to impulsive stresses, often more or less accompanied by vibrations, and in which, nevertheless, the detail or structure has to conform to certain narrow limits of size and weight. Such is the case with most applications of chains; for instance, to cranes, inclines, forge-slings, &c. Such is the case also, more or less, with railway axles; the axles of carriages on rough common roads; the gags of helve hammers; the porter bars fixed to the blooms whilst under the hammer; the iron wires of some piano-fortes; and many similar applications of wrought iron. The simple fact that only one-half of the gradually applied stress required to produce the proof strain will, if applied suddenly, of itself produce the proof strain (which if exceeded would injure the piece), goes a long way in explaining the matter. Where great interests of life and property are involved in the safe action of these applications of iron, the irresistible logic of facts has sometimes caused preparatory allowances to be made for these "fatigues of the metal." The axles of the London omnibuses are stated to be always renewed after having run a certain fixed mileage. This system is also carried out with the carriages of the Messageries Générales, the axles of which are changed after having run a limit of 40,000 kilomètres. The Honourable the Corporation of the Trinity House entirely renews all the moorings of the light-ships every four years —one-fourth of the number yearly. This limit of time gives the measure of the perfect efficiency of a good cable, well proportioned to its work, and in constant use day and night. Cables in ordinary ships are of course much less, or rather much more slowly, subject to deterioration. We have seen that M. David fixed the time after which a cable in ordinary use should be tested at ten or twelve years. Mr. Macdonald, of the Liverpool testing house, stated, before the 1860 Committee, that he would examine a cable after any long voyage—such as to India or Australia. The late Mr. Green, the great shipowner, explained that this was done with the mooring tackle of all his ships. An experienced pilot, Mr. G. J. Thompson, said that it should be made imperative to re-test chain cables every six years, and Mr. Smale fixed this limit at seven years. Mr. J. R. Clarke, however, the chief clerk of the store office, stated that there were many sound cables in store twenty years old. It is clear that it would be very difficult to fix a limit of time that could be applied to all classes of ships. The cables in the royal ships are scarcely so often or so severely tried by use as those of some merchant vessels. A cable might remain good for many years, and yet at last be injured in a single storm. Apart from accidents, such as abrasion on rocks, or against a sharp-cornered anchor stock, or similar causes, there are three main conditions affecting the duration of cables and furthering their progressive deterioration under wear:—1st, the friction and abrasion at the crowns; 2nd, rust and corrosion by the sea water; 3rd, undue strains on the cable, and in excess of the compressive and tensile elastic limits of the materials. The average amount of abrasion and consequent wear at the crowns could only be determined by a statistical comparison of the deterioration of a number of cables, worked under similar circumstances, through a certain period of time. No full observation of this kind seems to have been yet made. The same appears to be the case with the deterioration of iron cables by rust and corrosion. Mr. Mallet has observed, "that the metallic destruction by corrosion of iron in sea-water is a maximum in clear sea water of the temperature of 115° Fahr., that it is nearly as great in foul sea-water, and is a minimum in clear fresh river-water." It also appears that, the finer and more equable the quality of the iron, the slower is its corrosion. The alternative action of the air and the sea-water in ordinary cables must have some influence on their deterioration. Again, at a depth of, say, 100 fathoms, there would be a pressure of nearly 17 tons on the square foot, and this pressure would search out any slight crevice, or any slightly defective weld that had escaped the test. It is at these places that the corrosive action of the water is most felt. It is a well ascertained fact that the spongy mass of mechanically compressed crystals we call wrought iron, is porous, as water can be forced through it at comparatively moderate pressures. It is also well known that the hydrated oxide of iron we term rust performs the part of an electro-negative element when in contact with metallic iron, which is then electro-positive. When iron is rusting in the air, the moisture of the atmosphere is the exciting liquid, but this voltaic action must be greatly intensified in the presence of sea-water. I have noticed the interesting fact —which deserves more investigation than I have yet been able to give to it—that in the links of a great number of chains the wrought-iron is much more eaten away at the sides, where it is in contact with the cast-iron cross-stay. The same action was stated, in a number of the *Times* of last year, to have been observed on the wrought-iron tie-rods in contact with the plates of a cast-iron sea-water tank which burst last June at Woolwich. I had lately occasion to examine a number of old chains, after they had been cleaned, and after the rust had been knocked off with a hammer. All the cast-iron cross-stays, almost without an exception, were slack. Each link was thus temporarily reduced to the condition of an unstayed link, the ultimate strength of which, compared with a stayed link, is generally taken to be in the ratio of 7 to 9. When the cable is in use, the progress of this undoubtedly voltaic action in weakening them will be aided by mechanical causes.

The rust generated between the cross-stay and the sides of the link will be more or less washed out by the surge of the cable; a sufficient longitudinal stress would cause the virtually unstayed link to collapse on the stay; the sea-water would again search out the chinks; would again decompose the material; and the deterioration of the cable thus chemically and mechanically weakened, would progressively advance in successive increments that would render its ultimate destruction a mere matter of time. This action would be, of course, more felt in a cable in constant use, such as those of the Honourable the Corporation of the Trinity House; and whether zincing, which is stated by Dr. Parry to prevent rust, would be of any use, or whether other means, which will doubtless occur to many here, might prevent, or at least modify, this action, is perhaps a question worthy of investigation by the able men comprising the Trinity Board. There is, however, no need to search amongst the mysterious forces of nature for the main cause that leads to the ultimate destruction of a cable, or of any other application of iron, under like conditions. The primary cause of the destruction of a cable is simply due to the limit of elasticity of its material being exceeded. All chains are, by their very structure and special uses, subject to jerks and shocks; any country blacksmith knows that a chain that can stand a dead pull, would give way under the same weight if suddenly applied; and we all know that a careless labourer at the winch handle of a crane sometimes breaks down a good chain by a heedless jerk. Little more than $5\frac{1}{2}$ tons to the square inch, if suddenly applied, would at once bring on the proof strain of 11·46 tons; and although the dead weight of a cable is its great safeguard —so much so, in fact, that if the cable out of the hawser could be weighted at different parts of its length, this would be an advantage—yet, nevertheless, the safe load of about $2\frac{3}{4}$ tons, under an impulsive stress, to the square inch, must be often exceeded in practice. The safe load under an impulsive stress is in truth rather less, as the assumption is based upon the usual notion, which assimilates a cross-stayed link to a couple of bars.

It appears a paradox to say that the chain is, in one sense, strengthened by a strain in excess of the elastic limit, but such is the fact. The power to bear a static load is indeed increased, as was shown by the experiments cited, before the Committee of 1860, to prove that a cable is strengthened by being broken several times under the gradually applied load of the hydraulic press; and, as was also shown by the performances of the $1\frac{5}{8}$th bars subjected to the same treatment by Mr. Loyd. The link is, in the first place, mechanically strengthened by being drawn into a lozenge-like shape, as the two sides of each end then act as ties to a very short beam; but this is obtained at the expense of the elasticity of the material—the material of the link is rendered harder. It is a somewhat fanciful analogy to compare the limits of elasticity and of rupture of iron to the organic life of a plant or animal, but it is justified by the common expression that a bar is said to be crippled by an undue strain. If this living force in a bar—these *forces vives de resistance*, as they are termed by Poncelet—if, in one word, the work to be done in stretching a bar be expressed (in the English way shown by Mr. Mallet) by multiplying half the static load in pounds required to stretch a bar one foot long and of one-inch cross-section to its limit of elasticity, by its elongation in terms of a foot (T_e); and if the static load required to break the bar be expressed in the same way—by multiplying half the static load in pounds by the ultimate elongation in terms of a foot (T_r)—we shall then get the power for work expressed in foot pounds, or the structural value of our bar, and shall see the reason that a chain may be crippled for any application in which it is subject to an impulsive force. The short range, multiplied into the high static load required to stretch a bar of hard iron to its limit of elasticity, compared with the product of the long range but low static load required to stretch a bar of soft, ductile iron, will show that a link made of hard, brittle iron will keep its shape much better than one made of soft, ductile iron. A calculation of the work done in rupturing a bar of soft iron will show that its living force of resistance to rupture is several hundred times greater than the force required to alter its elasticity; and a similar calculation of the work done in rupturing a bar of hard iron will show that the work to be done in breaking it is perhaps twenty times less than that in stretching it to its elastic limit. As any impulsive force is equal to twice the work to be done in producing or consuming it, and as the effort required is less as the distance gone over is greater, it will be seen that, although resilience is a *sine quâ non* in a cable, the strength of the links would be destroyed, and the structural flexibility of the whole cable would be injured, by the use of iron too soft; while the use of very hard iron in the first instance, or the ultimate hardening of any iron when its limits of elasticity are exceeded, renders a cable of hard or hardened iron utterly useless for its intended purpose.

There is thus no necessity to have recourse to any theory of the crystallization of iron under impulsive stresses to explain the gradual deterioration of a cable; but this question of crystallization is one of the greatest importance and interest; and we may yet learn that the structural value, for many purposes, of a given bar of iron is in some determinate relation to the size of the facets of the crystals of which it is composed. A good cable bar consists of crystals that have been more or less elongated while passing through the rolls; the question is whether these crystals are loosened or separated at their planes of cleavage, or whether the crystalline axes have been transposed, under the undue strains, more or less accompanied by vibration, to which chains in general, and chain-cables in particular, are necessarily subject. There is no well-ascertained instance of any alteration of this kind happening under moderate stresses, but Mr. Mallet appears to believe that a reversal of the crystalline axes takes place when the elastic limit, either of extension or compression, and therefore of flexure, is exceeded, and more especially if the piece be not initially in a state of molecular repose. There is every reason to believe in the existence of internal strains in the link of a chain, and more especially at the crowns. But numberless experiments by Dr. Rankine and others, and more particularly by Mr. Kirkaldy, have shown that what is popularly called a crystalline fracture may be given to the most fibrous piece of iron if it be broken under a suddenly-applied load—an effect simply due to the mechanical effect of a sudden stress, and to the fact that any piece of iron is an assemblage of crystals. There is no reason to believe that a magnifying glass — as was, indeed, shown by Robert Stephenson—would reveal any material difference between a bar broken after fatigue of whatever kind, or a bar broken when fresh from the mill. At the same time, the application of a very powerful miscroscope to the molecular structure of iron has yet to be made; and the history of the first application of the telescope to a very different science may yet find its counterpart in this department of physical knowledge.

Whatever be the internal effect of the lateral contraction induced by excessive tensile strains, it would be of the utmost importance to settle, once and for all, whether re-annealing can restore the living force of resistance of iron, and, therefore, of a cable. Mr. T. M. Gladstone, C.E., recommended this plan before the Committee of 1860. Mr. Smale, then of Woolwich, said that this would be like Burnetising rotten wood. Dr. Noad, in a letter to the *Times*, about eight years ago, stated that he had taken away the brittleness of an old chain by keeping it for 24 hours in a furnace. The late Mr. Glynn recommended that a crane chain should be annealed every three years. At the North Roskear mine, in Cornwall, it is stated by M. Moissonet that the pit-chains are withdrawn from the shaft after every six months' use, are rolled in a heap, then covered with a sort of cylindrical furnace, and brought to a red heat. According to an account translated

from the Russian into the *Polytechnisches Centralblatt*, the chain cables for the Russian government, after being brought to a dark-red heat immediately after testing, are then tarred—a plan which is said to prevent rusting, as the tar thus takes a firmer hold on the iron. But many things may be done with charcoal iron that it would not be safe to attempt with our ordinary iron. Baudriment appears to believe that all metals only acquire determinate qualities by proper annealing, and that a cherry-red heat is necessary for annealing wrought iron. According to the experiments by the Franklin Institute, wrought iron is perfectly annealed at a clear bright red. The experiments of both Baudrimont and the Franklin Institute show that the ultimate tenacity of iron is considerably diminished by annealing, but, unfortunately, in neither case was the elongation noticed. Poncelet has shown that his co-efficient, T_e, of elasticity is increased with annealed iron, but that the co-efficient of rupture, T_r, is diminished. This refers to wires, and no complete experiments appear to have been yet made on the effect of annealing on bars. It is a question whether the extra ductility conferred on the links by the process of annealing would not, while rendering them more ductile, at the same time lead to their changing their form. At any rate, at least some of the cast-iron cross-stays would be rendered less able to withstand distortion. At the same time, the question ought to be settled, and to cables comparatively uninjured by corrosion, the process might prove of great value. The conditions of size in a cable are peculiarly favourable to the use of annealing. Great as the advantage would be in the successful application of annealing to large forgings, there are several well-authenticated instances of massive crystals being developed in the interior of the mass by the long-continued action of a red heat. General Morin thus mentions an instance of the production of crystals, with facets from 4 to 5 millimetres in breadth, in a charcoal iron bar originally of fine, soft, fibrous, texture.

Tied as we are in testing cables within a narrow limit, which if exceeded in either direction would, on the one hand, either impair the efficiency of the cable, or, on the other, the efficiency of the test, it is clear that the most thorough accuracy is required in measuring the proof stress. Unfortunately, it is not always the case that this accuracy is obtained. The stress exerted by the machine of M. David, of Havre, was shown by the French government to be taken too high. The appliance for the measurement of the stress exerted by the Liverpool corporation testing machine, was a few years ago shown by Mr. Mallet to give a result of nearly 9½ per cent. error in excess. Some of these machines consist of a powerful windlass purchase, but we will confine our attention to the direct-acting hydraulic press, the application of which to the testing of chain cables, by the late Sir Samuel Brown, may be said to have rendered the iron cable a practicable thing. There are three distinct ways of measuring, or at least approximately measuring, the stress exerted by the press plunger. 1st. A small valve is fitted to the cylinder and furnished with a steel-yard and adjustable weight. In large machines this is, for the sake of convenience, carried to a distance from the press, the water being conveyed in a small pipe. 2nd. A Bourdon gauge is attached in the same way, either direct on the cylinder, or it is placed in communication therewith by means of a small pipe. 3rd. The other end of the chain being tested is attached to the head of a bent iron lever, the power of which is multiplied by a system of levers balanced on knife edges. The plan of measuring the stress exerted by the press plunger, by means of a weighted valve, is liable to several objections, as was pointed out many years ago by Professor Peter Barlow, more recently by Professor Rankine, and by Mr. Bowman in his evidence before the 1860 Committee. In the first place, the relative proportion between the pump plunger and the valve is necessarily great; and a simple calculation will show that a hair's breadth more or less to the valve would make an important difference. In the next place, the friction of the leathers and the weight of the plunger are not taken into account; the gross load on the plunger is, in fact, given as the useful work at the end of the piston rod. Some experiments made by Professor Rankine, whose name is a sufficient guarantee in matters of this kind, have shown that about one-tenth should be deducted from the pressure in the hydraulic press, merely for the friction of the press plunger. The real, the useful work exerted at the end of the plunger on the chain is thus more than 10 per cent. less than is given by the pressure of the water. An error in the opposite direction will be made by conducting the pressure of the water, either on a weighted valve, or on a Bourdon gauge, and this error will vary with the diameter of the pipe, the number of bends, and the other losses of effect in a stream of water passing through a pipe, which are well known to engineers. The load on a safety valve is always an unreliable datum for computing pressure; a Bourdon gauge is much more delicate, but, in this case, its indications are erroneous, unless proper allowance be made for the friction of the leathers and the weight of the plunger. The most exact means yet employed for measuring the stress created by the plunger on the chain, consists in the use of a system of balanced levers, according to the plan adopted at H.M. Woolwich and Portsmouth dockyards, and by Messrs. Brown and Lenox. The press at Woolwich is also furnished with a weighted valve, according to the plan just mentioned, and in addition to the system of levers. The lever scale is perfectly sensible to a few pounds, but the valve scale will scarcely move with a load of two tons, and it is less and less sensible as the loads increase. The balanced levers are perfectly accurate, but the apparatus is rather expensive. At the last Worcester Show of the Royal Agricultural Society, a certain apparatus (not patented) was exhibited for testing the draught of Fowler's six-furrow steam-plough, and it appears to me that a modification of this dynamometer might be employed for registering the stress on a cable. It consisted essentially of a cylinder, and a piston, on one side of which was a volume of water in communication with a Bourdon gauge. The water was enclosed in an elastic diaphragm, fixed to the piston and to the cover, and the gauge was necessarily marked according to the results given by weights gradually applied. By shrinking rings on the outside, or by straining on a coil of wire, the cylinder could be made to stand any amount of pressure required, and, if adjusted with the cross shackle pins at the opposite ends, at right angles to each other, in order to prevent any torsion, and also by the adoption of other simple means, such as the use of steel, that will occur to those now present, a light instrument of probably very great delicacy would be obtained.

When a long length of cable, say of seventy-five fathoms, is being tested, there is another influence that will, in some cases, affect the result. If we take the comparatively light one-inch cable, we find that it weighs 58lbs. per fathom, so that the whole length will weigh nearly two tons. The last link at each end will have to stand a down pull of nearly one ton in addition to the longitudinal stress of 18 tons. This, however, would probably be practically compensated by directing the hammer test more towards the centre portions of the cable, and the *vis viva* of each blow will be absorbed by the elasticity of the metal, the deflection of each link struck, and by the combined weight and resilience of a certain portion of the cable within the range of each blow. It may here be noticed that in testing the effect of impact on beams, Mr. Hodgkinson used a 4lb. leaden cushion in order to partially deaden the jar of the blow. In a leading article of one of the engineering journals, in May last year, giving an account of Lloyd's proving house, it was proposed that "a falling weight, to be released by a trigger tripped by a long cord," should be employed instead of the hammer, in order to prevent any accident to the operative, through the flying of the cable or a chip of the cast iron cross-stays. This weight could be made to slide overhead in the same vertical plane as the cable; and by letting it fall from heights

determined for each diameter of cable, the *vis viva* employed could be measured with approximate accuracy. This would only be on a par with the plan adopted in numberless instances, as we have seen, by our scientific neighbours the French; and similar measures might perhaps be used to measure the blow required to carry out the fracture test.

The application of known impulsive force as a test is of the utmost value, more especially when, as with cables, the object tested will have to undergo such forces in practice. If some plan could be devised for easily and accurately submitting the whole length simultaneously to a sudden instead of a static load, this would be of great importance. In the mean time, the hammer-blows are the tests for the resilience of the cable. In doubtful cases Professor Daniell's acid test might be of value in examining the structure of the fractured sections of the two or three links that are usually broken up. A great number of experiments on the specific gravity of iron have shown that it would be dangerous to make deductions as to the qualities of a specimen of wrought-iron worked by one metallurgical process, and to then apply these results to a bar produced by another mode—for instance, to compare in this way a rolled bar with a hammered bar. At the same time there is a remarkably close, though not perfect, correspondence between the specific gravity and the quality of the specimens. Mr. Kirkaldy found that the specific gravity of iron was even decreased by being much strained—at any rate by tension. It is very easy to obtain the specific gravity of any substance like iron; and whether the physical facts that, 1st, the gravities of, for instance, No. 3 bars, bear a pretty constant relation to their qualities; and that, 2nd, the specific gravity of wrought-iron generally is diminished by tensional straining; and, 3rd, that it is considerably increased by annealing, might be used in practice for testing the quality of the iron, or the deterioration through wear of a chain, is at least worth an inquiry.

The physical conditions involved in the construction, the use, and the testing of anchors, differ so materially from those of chain cables, that the two subjects must be separated in an examination of this kind. But there can be little doubt that a sound and general system of testing the mooring tackle of ships will bring about the same improvement in the quality of chain cables and anchors, as the trials at Shoeburyness have already effected in the quality of rolled plates; and the effect will indeed be produced by somewhat similar causes.

DISCUSSION.

Mr. T. M. Gladstone, (Superintendent of Lloyd's Proving House, at Poplar,) said he had had considerable experience in the subject which had been treated of by Mr. Paget in so elaborate a manner. There were, however, one or two points on which he differed from that gentleman. Mr. Paget had stated that the crown was the weakest point in the link of a chain. Now if that were so this would be the point which would usually give way in the breaking of a chain, but in the course of his experience, extending over a period of 30 years, and having the superintendence of Lloyd's testing machine, he had not found that this was the case. [Mr. Gladstone exhibited some specimens of links broken under the testing apparatus, showing the fracture to have occurred on the side of the link.] The next point on which he ventured to differ from Mr. Paget was the statement that the breaking strength did not indicate the quality of the iron. Now, he did not know anything which more completely determined the quality of iron than the ultimate tensile strength, except, of course, when converted into steel, the tensile strength of which might be much greater than that of iron, but it might be unfitted for the purposes of a chain cable owing to its brittleness. If they struck it suddenly with a hammer it would break like glass. Then as to the question of injury to iron by testing, if they could make a certainty of having a chain of the finest quality, both in material and workmanship, there was no question it would be most desirable not to subject such a chain to the process of testing; but this became a necessity, inasmuch as in the absence of certainty as to the workmanship and material, they were obliged to subject the article to some test. The late Sir Samuel Brown ascertained by numerous experiments what was the proper test to apply to chain cables; and he (Mr. Gladstone), humbly following in the steps of Sir Samuel Brown, could corroborate his conclusions. He decided that 650 lbs. to a circle one-eighth of an inch in diameter was the proper strain to apply. There were on the table some specimens of links $1\frac{1}{2}$ inch in diameter, which had been broken that day by Lloyd's machine. The Admiralty proof was $40\frac{1}{2}$ tons, but the chain stood the strain of $59\frac{1}{2}$ tons, and then separated, the iron being perfectly sound, and of fine quality. That, he said, showed that the Admiralty test was not such a test as would at all distress a properly manufactured cable. The value of the proving was this, to show that common iron would not stand the Admiralty test. No. 2 iron would stand the merchant service test, but would not stand the Admiralty test. Sir S. Brown's test put a stop to the use of inferior iron, and therefore was most valuable. Reference had been made in the paper to the evidence of Mr. Bowman, given in 1860, that he desired a higher test, but he (Mr. Gladstone) thought that whereas No. 2 iron would not stand the Admiralty test, they had a tolerable warranty that no inferior iron would be passed. In the manufacture of a chain, the great difficulty was, with careless workmen, to get a perfect weld. He knew instances in which A1 ships had been provided with chains the welding of which had been imperfect from the first; and when he told them that in the last half of 1863 there were 32,000 fathoms of chain tested at Lloyd's machine, and that one-fourth of those were imperfect, and that 2,000 fathoms were completely condemned, it showed how very lamentable was the state of the chain cable manufacture in the merchant service. Mr. Pope, however, had said, in 1860, that the test was too high, but he (Mr. Gladstone) would abide by Sir Samuel Brown's experience. With regard to the influence of temperature —so far as testing in the machine was concerned, the temperature was a matter of small importance, in his opinion, although in the royal dockyards a standard temperature was adopted. With the machine at Poplar he could test seventy-five fathoms of chain in five minutes from the time the machine was put into operation. The action of the test upon iron was to raise the temperature, and if they put the thermometer to it they would find that in proportion to the strain the heat would increase very rapidly, so that at the time of fracture the iron became too hot for the hand to bear. The mere difference of temperature from zero up to the ordinary temperature in this country would be overcome in five minutes by the action of the strain upon the iron, but if a sudden jerk came upon it the temperature was then an important condition. Mr. Paget had referred to the difference between the strength of iron in the direction of the fibre, as compared with the cross grain. He (Mr. Gladstone) was now making boat plates, and, in order to meet this objection, there had been introduced a kind of weaving action in the rolling by passing the plate through the rollers first in one direction and then in another. With regard to the retesting of chains after use, he considered it was valuable in some respects, but it required to be done with great care. It was, however, desirable to know what the value of a chain was after a series of years, and this would only be ascertained by retesting. If a chain had been exposed to much wear, it was often desirable that it should be reannealed to renew its elasticity. Mr. Paget had made a rather warm attack upon the hydraulic press process of testing, and maintained it was not so good a machine for the purpose as the lever. He (Mr. Gladstone) had had a good deal of experience with the hydraulic press, having one of 300 tons power

under his superintendence, and he could state that the total amount of friction that applied to it did not amount to more than eleven cwt., and that amount was constant, because, when once they overcame the effect of the friction of the leathers there was no difference whether they had 300 tons upon it or one ton. Mr. Paget had stated that the error as compared with a steelyard was two tons, which, if it were the fact, would alter his opinion as to the value of the hydraulic system as applied to testing machinery. Mr. Paget had further stated that in testing a chain 75 fathoms long, one inch in diameter, inasmuch as it weighed two tons, there was a material difference in the strain between one end and the other. It was true, if they suspended a chain of 75 fathoms, the link that held the weight of two tons had two tons more than the link at the other end, but if they laid the chain horizontally and supported it on rollers every 15 fathoms, and then put a strain upon it, there was no appreciable difference between one part of the chain and another. He had practically tested this question, and had found this to be the case. Sir Samuel Brown had been named as the introducer of chain cables, but he (Mr. Gladstone) found that they were used in much earlier times, being mentioned by Cæsar, in his history of the Gallic war. He had made considerable observations as to the corrosion of chains, &c., by the action of sea-water. He believed that was an element of great moment in the deterioration of chains, but he had often seen that a chain was more injured by rust, when laid by in the locker of a ship than when in use. Wrought iron was more easily oxidised than cast iron. The latter would last three times as long as the former in the shape of rails. The cast-iron railing round St. Paul's, though it had stood upwards of 150 years, showed but little deterioration, while he had seen wrought iron railings reduced almost to nothing in a comparatively short time.

Mr. FREDERICK LAWRENCE agreed with Mr. Gladstone in his opinion that the crown of the link was not its weakest part. It was not the weakest place when the chain was made, but it became so after the chain had been in use for a length of time. The crown of the link was where the wear took place, and if a chain were tested after it had been in use, he believed the link would break at the crown. He was inclined to think the Admiralty test was too high, and the examples brought before them by Mr. Gladstone were evidences that this was the case. The Admiralty test of a chain like that on the table was $40\frac{1}{2}$ tons; $59\frac{1}{2}$ tons were applied to it and it broke. Thus they had been straining the chain with $40\frac{1}{2}$ tons, when it would break by putting 19 tons more upon it. He had no hesitation in saying that, in testing that chain to 40 tons, they injured it, without any advantage being gained. He believed the proper test for wrought iron should not exceed eight tons to the square inch. If chains were proved to that, it would be all that was necessary to ensure safety. It was not perhaps generally known that manufacturers of chains made their workmen answerable for a faulty one, and if a chain was defective in workmanship the workmen were not paid for the making of it; so that the knowledge that the chains would be tested made the men careful to see that the welds were well made. It was wonderful that chains did not break more often, when it was borne in mind that in a long length of chain there were such an immense number of welds all depending upon the skill of the workmen, and that the slightest burning of the iron, and the slightest fault in the welds rendered the chain liable to break. He thought to put too high a test on a chain was not wise. He believed so high a test was of no use as a security, and was, moreover, injurious. That chains should be tested there could be no question, and he thought it of importance that the chains of merchant ships should be tested at regular authorised places. He did not say they should be subjected to so high a test as the Admiralty standard, but there should be some test to prove that a good chain had been supplied. There was nothing so bad as a cheap chain; and owners of ships were sometimes led to practise a false economy in that respect, because a cheap chain meant cheap iron and cheap labour, which were synonymous with bad iron and bad labour.

Mr. SHIPTON said, having had the privilege of witnessing a great many of Mr. William Fairbairn's experiments, he differed entirely from the last speaker in fixing the limits of the test at eight tons to the square inch. The experiments of Sir William Brown through a long series of years had led to the adoption of what was now the Admiralty test, and, therefore, he could not see how the limit could be fixed at eight tons, because manufacturers, in regulating the quality of their iron, had gone so near to what would just stand the Admiralty test, that a lower standard would lead to the use of iron of a very inferior quality.

Mr. LAWRENCE explained that the reason why he fixed upon eight tons to the square inch was, that it was known that the breaking strain of good iron was about 24 tons to the square inch, and he thought that the test should not exceed one-third of the breaking weight. More than that he believed tended to injure the chain. He thought besides this test, the quality of iron in a chain should be ascertained by testing some of the links to their breaking strain.

Mr. GLADSTONE added that he started with the proposition, that if they could rely upon the quality of iron and the workmanship, no test would be necessary. But, owing to the competition that existed in the chain manufacture great depreciation had taken place in the quality of iron, as well as in the workmanship; and, therefore, to provide against an admitted evil, there was a necessity for testing to a given point, and he had endeavoured to show that the standard arrived at by Sir Samuel Brown was the proper one.

Capt. SELWYN, R.N., thought the gallant chairman, distinguished as he was in the profession to which he belonged, would allow him to say, on behalf of that profession, how immensely important the question of good chain cables was, and how vast was the responsibility which attached to the chain manufacturer in such matters. In it were merely a question of property, that would have some influence, but when the lives of a large ship's crew depended on the quality of the cables produced, the responsibility of the manufacturer was largely increased. In the matter of tests, it appeared to be lost sight of that all tests, whether of guns, bridges, or railways, were carried much beyond the strain they would ever be called upon to bear in actual use. As much as 14 bullets and 16 drachms of powder had been used in testing a rifle made of Bessemer's steel; why, therefore, should chain-makers complain at being subjected to the Admiralty test? Would it not rather be wise on their part to endeavour to improve the quality of the iron they used, thereby diminishing the weight of the cable, by the use of a better quality of iron, or that modified iron manufactured by Mr. Bessemer. There was no security with such a test as eight tons. If a chain bore this it might break at twelve or sixteen tons. With reference to this subject he would draw attention to a system patented by a Spanish lady, which was shown at the Exhibition of 1862, and which, he had been informed, was under trial at one of the dockyards. In this system steel was employed for chain cables instead of iron. Thin plates of steel were put together to form the link, and afterwards immersed in a bath of metal, which made them impenetrable to the action of salt water. Steel, when drawn out into wire, gave a tensile strength of something like 136 tons per square inch, whilst the bar of steel from which it was drawn would only bear 56 tons. The appearance of the fracture of wire always showed them that the principal part of the strength of the wire resided in the outer crust, hardened by the process of drawing. He thought Mr. Paget had been misunderstood by some gentlemen in speaking of the strength of a cable. He did not mean that the crown of the link

was where the cable would break, because the strain did not come so directly upon it at that point, but merely that this was the part of the link that was necessarily the weakest, owing to the state of tension that the bending of the iron produced. With reference to the tension brought on chains, the chairman would agree with him that usually the amount of cable out was so great that the last few fathoms next the anchor lay on the bottom, and so the full force of the strain was never felt. There was in fact a spring-like action, so that no sudden, impulsive strain was put upon the cable. The hydraulic press, therefore, in a measure, did meet the required conditions of test, and therefore it appeared to him the most fitting machine that could be employed. It would be better if they could make the test under the same conditions of catenary strain, but that was practically impossible. He would mention that during the time he was serving under the command of the chairman, it became necessary to moor the ship on the equator for the purposes of survey, and she was moored in 60 fathoms water with two bower chains, and so great was the strain in heaving up those two cables, that the hawse pipe was cut through, but the cables stood as no cable could have been warranted to do if the test had been diminished to eight tons.

The CHAIRMAN said that in his experience he had not observed a chain cable part at the crown of a link; the rupture also more frequently occurred near the anchor than at the hawse holes. As regarded the observation attributed to Mr. Loyd in relation to breaking and rewelding bars—proving that they were stronger after welding, he considered that good welds should produce this effect. The iron at this point received special treatment—it was "jumped" for the weld and hammered to a better surface. As to the dates at which chain cables were used in the navy, his experience went back as far as 1815. They were used at Algiers in 1816, in Arctic service in 1825, and on the coast of Africa in 1830-33. He had occasion to moor his ship with very taut cables, and they had experienced much abrasion within the crowns of the links from constant service. But the greatest damage to chain cables resulted from galvanic action by the chain coming in contact with the copper on the stem; and he recollected a case at Rio Janeiro where the officers of a ship in which the bridles were kept taut against the stem, reported that the furrows resulting from this were eaten by the rats. This, he need hardly say, was owing to galvanic action. With reference to iron becoming brittle by intense cold, he recollected, as a boy, when skating at very low temperatures, the skates broke like glass. As to the fishermen using hempen instead of chain cables, that resulted from the impossibility of holding cold iron at low temperatures, but, as a rule, iron below water could not be subject to a lower temperature than 28·5°, when the atmosphere might be as low as — 62°. With regard to testing cables, he was of opinion, from the causes to which he had alluded, that all cables should, particularly if used in copper-sheathed vessels in tropical climates, be proved on the return of the vessels to this country, as one faulty link might lose ship and crew. With regard to the strength of steel cables, the late invention of drawing steel tubes cold, without impairing the texture or tensile strength of the material, proved its great tenacity. He was sure that all present would unite in a cordial vote of thanks to Mr. Paget for his valuable paper.

A vote of thanks was then passed.

Mr. PAGET, in acknowledging the compliment, stated that a reference to his paper would show that Mr. Gladstone's remarks corroborated its substance, and, as he had the greatest respect for Mr. Gladstone's abilities and experience, this gave him great satisfaction. It would be seen that though he (Mr. Paget) showed that the link was *theoretically* weaker at its crown, nevertheless, the practical contingencies of welding rendered one of the sides practically weaker. As an experienced workman, he was well aware of the uncertainty of welds. In stating that a steel bar, which might have an ultimate breaking strength much higher than a similar wrought-iron bar, might, nevertheless, be unfit for a cable, Mr. Gladstone corroborated his (Mr. Paget's) assertion that the ultimate breaking strength *alone* was not the true indication of the value of any material of construction. Other remarks by Mr. Gladstone favoured the same views. In the same way Mr. Gladstone appeared to believe that the Admiralty test, if often repeated, would diminish the value of a cable, or at any rate a per-centage of ordinary cables, and he (Mr. Paget) had been careful to point out that the test could not be too high for the welds alone, while, for the iron, it ought to be confined within its limit of elasticity, and that the present Navy test was probably the best. He (Mr. Paget) did not venture to express a distinct opinion as to the influence of frost on iron, but he had stated that iron was heated in the very act of straining it. The question was:—Did the strain, or the internal friction thereby generated, sufficiently raise the temperature of the chain to allow it, *cæteris paribus*, to scathlessly undergo the percussion of the hammer test? Mr. Gladstone had stated that doctors differed, and, without laying claim to more than student's rank, he ventured, with every respect for Mr. Gladstone, to differ from him in his mode of estimating the stress practically exerted by the press plunger. Just as an indicator diagram cannot be taken by placing the indicator on the steam-pipe, so allowance must be made for the consumption of work, in moving the plunger, in the friction of the leathers, &c. The question between himself and Mr. Gladstone was:—Did the friction increase, or did it not increase, with the pressure of the water? Mr. Paget ventured to refer to the known general laws of friction as corroborating his assertion; to the special experiments on hydraulic presses by Dr. Rankine; and to the ocular demonstration as to the relative value of the two systems of measurement, to be seen in H.M. dockyards. The paper he had had the honour of laying before the meeting was simply an application of known practical engineering principles to the testing of chain cables; he (Mr. Paget) fully saw its shortcomings, which were, leaving out any other cause, in a great measure due to the comparatively provisional state of science bearing on the strength of materials. As the paper was intended to treat on the testing alone of cables, he did not consider it necessary to reply to the extremely interesting observations of some of the speakers on the practical working of cables.

Proceedings of Institutions.

HULL YOUNG PEOPLE'S CHRISTIAN AND LITERARY INSTITUTE.—The fourth annual report congratulates the members on the position of the society. The income amounted to £360 16s. 6d., and the expenditure to £326 12s. 8d., leaving a balance in favour of the Institute of £34 3s. 10d. In addition to this there was a small income arising from other sources, making a total of £40 19s. 10d., which would go towards the reduction of the debt. The lecture course had been greatly more self-supporting than in previous years. The income of the library amounted to upwards of £50, which was very considerably more than in any former year. The special lecture, for the benefit of the library, had realised £34 14s. The total number of issues was upwards of 14,000, which was unprecedently large. The total number of books at present was 889; increase for the year, 105 vols. It having been resolved to admit lady subscribers to the use of the library, the committee were making renewed efforts to increase the number of books, and they recorded with great pleasure a valuable gift of fifty volumes, standard works, recently made by the president, W. Irving, Esq. This donation was to be made the nucleus of a further increase. The committee also acknowledged a valuable present from Admiral Fitzroy, of maps and charts illustrative of the principles on which his forecasts of weather are founded.

The classes in connection with the Institution were, the Sunday Bible class, weekly discussion class, German, French, and short-hand classes. The annual excursion had been very satisfactory. The cricket club maintained its previous character as a most interesting feature of the Institute. The committee had been disappointed in the hope of obtaining new premises. They had been compelled to decline the site opposite the present building, and no other suitable one had been met with. The committee had to regret the departure of the late secretary, Mr. James Sibree, to Madagascar. The best wishes of the society followed him thither. The number of members was about fifty less than last year. The total number was about 1,100. The diminution was apparent rather than real. A discussion took place at the annual meeting on a proposal to alter the name to "The Christian and Literary Institute." The motion was negatived by a large majority.

Yorkshire Union of Mechanics' Institutes.—The annual meeting of this Union is to be held on Wednesday the 18th May, Sheffield being the appointed place this year. The proceedings commence with a conference of delegates from the several Institutes in the Union, at which some interesting subjects undergo discussion, Mr. Edward Baines, M.P., the president of the Union, being the chairman. In the evening there will be a public meeting, at which his Grace the Duke of Argyll, K.T., Lord Privy Seal, will preside, and it is expected that the meeting will also be addressed by several distinguished friends of popular education, including Mr. J. A. Roebuck, M.P., Mr. Baines, M.P., Mr. Harry Chester, vice-president of the Society of Arts, Mr. Thomas Dunn, the Rev. Canon Sale, and others. The committees are actively engaged in making the necessary preparations, and on the following day, which is usually devoted to recreation, there will be an excursion to Chatsworth, the seat of the Duke of Devonshire.

Fine Arts.

Recent Sales of Works of Art in Paris.—Many important collections have recently been dispersed by the hammer of the auctioneer. The sketches and drawings by Prud'hon, bequeathed by the painter, who died in 1823, to his friend Monsieur de Boisfremont, attracted great attention and deservedly so. The sketches exceeded two hundred, and several of them had never been carried into execution as finished pictures; but the studies after nature obtained most attention, fetching from four to eight hundred francs each. The growing taste for the works of Prud'hon, as compared with those of his great but meretricious rival, David, is one of the best signs of the progress of artistic feeling in France. At a miscellaneous sale, which occurred last week, a painting of a vase of flowers by Delacroix fetched £83, and another, the "Education of the Virgin," £88, while a drawing by the same author, in pastel, the "Education of Achilles," realized £50; and an oil painting by Ary Scheffer, the "Temptation of Christ," £256. At the sale of the collection of Dr. Van Cleef, of Utrecht, which occurred here, some fine pictures were disposed of. "Players at Bowls," by Jan Steen, fetched £134; "Three Cows in a Meadow," by Paul Potter, £116; two bouquets of flowers, by H. Upping, £140; "A Peasant leaning over a Half-hatch door," by Adrian Van Ostade, £65; portrait of himself, by Rembrandt, £80; and the "Master of the Vineyard," from the parable of Christ, by the same, £1,012; "The Cradle," by De Hoogh, £36; "Saltimbanques," by Philip Wouvermans, £148; and a Claude, "The Entrance of the Port of Ancona," £600. A most interesting collection of drawings by Albert Dürer, the property of Comte Andréossy, was dispersed by the hammer, the prices being exceedingly high. The following are some of the most remarkable:—A pen and ink drawing, heightened with white, of Christ in the tomb, signed and dated 1495, £41; portraits of German seigneurs, same style, dated 1521, £58; a drawing, 1520, of Adam and Eve, £100; a young man on horse-back, with a lady behind him, dated 1508, £44; and fine sketches of flowers and animals on vellum, signed and dated 1508-21-23-26, £69 8s.

Manufactures.

Museum for Inventions.—Mr. Dillwyn called attention in the House of Commons on Friday, the 29th April, to the insufficiency and inconvenience of the temporary Museum for Inventions at South Kensington, and the Patent Office in Southampton-buildings, and to the expediency of uniting the Museum for Inventions and the Patent Office under one building, and at a convenient distance from the law courts. He then went on to say that the Patent Office possessed the nucleus of an excellent musem of models of inventions, but that the South Kensington institution was not the proper place for them. The models were thrown together at Kensington in such a manner that nobody appeared to take the least interest in them. But, bad as the models and inventions were, the Patent Office library was in a worse state; for, owing to the smallness of the space, the books were stowed away in nooks and corners; and there was not sufficient accommodation for readers. He objected to a library of this sort being sent to so distant a place as Kensington, and thought that both the library and the models of inventions should be removed to some suitable building in the vicinity of the courts of law. His objection to the site at South Kensington was, that it was too far away for the working classes, and from the centre of the metropolis. It was said to be exceedingly difficult to get a site near the centre of the metropolis. He had been told, however, that an adequate site was easily attainable in Chancery-lane, and he felt sure that would be a much better locality than South Kensington for the museum. —Mr. Gregory asked whether the Patent Commissioners were agreed that the museum should be at South Kensington; for if so, they had changed their minds within the last year and a half. In their report of 1862 they stated that the office, library, and museum should either be under the same roof, or at least contiguous to each other; and another consideration which they urged was, that all three should be in some central spot. He also wanted to know whether the Patent Commissioners had been consulted in the matter, and whether they considered South Kensington a central site.—Mr. Cowper admitted that the Patent Office in Southampton-buildings was at present very conveniently situated, but that the accommodation for the library, &c., was by no means adequate. Up to 1853 the building was sufficient for the public wants; but the library had since increased so rapidly that the building was no longer commensurate with the demands upon it. The necessity, therefore, for increased accommodation had been pressed upon the Government and upon the commissioners; but, as the Patent Office ought to be in the legal quarters that were close to the inns of court, there was extreme difficulty in finding sufficient accommodation. They, however, had in view a building in that neighbourhood, which would be amply sufficient for the purpose of an office and library. There was, however, no possibility of placing the museum under the same building; and indeed the museum had never been connected with the Patent Office. Last year, when the Government were asked for what purpose they recommended the purchase of the site at South Kensington, they explained that they did so because, among other reasons, it was well suited for the patent museum. He had therefore invited public competition for the erection upon that site of a building capable of containing the patent museum and the natural

history collection. Of the two sites he thought South Kensington quite as approachable for the working classes as Chancery-lane. But, at any rate, the commissioners recommended that, for the present, half an acre should be devoted to the museum, and hereafter a much larger space than that. It would be impossible, however, to find that large space in the vicinity of the Patent Office, and that was a strong reason for availing themselves of the site at South Kensington. He could not point to any clear statement of the commissioners favouring the removal to South Kensington, but he believed they would be satisfied if complete space were found for the purpose.—Colonel Barttelot protested against the supposition that the House, by its vote of last year, had approved of the proposal that the museum and the other buildings should be located at Kensington —Mr. A. Smith likewise concurred in the notion that no engagement had been entered into last year respecting the appropriation of the site at South Kensington.—Mr. Ayrton complained of the ambiguous position in which the question had been left by the Government, and hoped that it would be referred to a select committee at the earliest possible day.—The subject then dropped.

IRON, MACHINE, AND ENGINEER TOOL TRADES.—The April report of the Leeds Chamber of Commerce states, that during the month there has been a good demand for all sorts of iron, but nearly all the works have now ceased, owing to a dispute between the masters and men in reference to trades unions, and which does not appear likely to be soon settled. This dispute has caused several thousand men, in various branches, to be thrown out of work in this neighbourhood. The machine makers continue to be very busy. The engineer tool trade is very good, and the makers have considerable orders in hand. The makers of locomotives and railway plant are very busy. The dispute in the iron trade will not much affect these branches.

Obituary.

JAMES KERSHAW, M.P., died at Streatham on the 27th April. He was one of the members for Stockport, and head of the firm of Kershaw, Sidebottom, and Co., cotton spinners, manufacturers, and calico printers, Portland-street, Manchester. He was born in 1795, and started in life as a warehouse lad, but showed such eminent business qualities that at an early age he was made partner in the mercantile firm of Lees, Millington, and Callender, of which he became ultimately the leading partner. It was not till some years after that he became a spinner and manufacturer. As a Liberal politician he took part in most of the stirring events in Manchester, from 1830 forwards, including the Reform and Anti-Corn-Law League agitations. He was a member of the council of the League, and was a subscriber of £1,000 to the fund, and about the same time he subscribed £1,000 towards purchasing public parks for the people of Manchester. He was also a liberal supporter of schools and of foreign missions. He was an earnest supporter of the movement for obtaining a charter of incorporation for Manchester; was elected an alderman of the first town council under the charter, and was made third mayor of Manchester in 1843, holding the office for two years. He became a candidate for the representation of Stockport in Parliament along with Mr. Cobden, in July, 1847, but was defeated. In December of the same year, however, on Mr. Cobden vacating his seat for Stockport, to accept a seat for the West Riding of Yorkshire, he stood a second contest, and was elected. He continued to hold the seat till his death. He lost his only son some years ago, but several daughters survive him.

THOMAS HENRY MAUDSLAY, the well-known head of the firm of Maudslay, Sons, and Field, engineers, was born on the 16th June, 1792, and died on the 23rd April, 1864, aged about 72 years. He began to work in early life with his father, the mechanic, Mr. Henry Maudslay, in Margaret-street, Cavendish-square, whose life will be found in Smiles' "Lives of the Engineers," Smiles' "Self Help," &c. The block machinery, although first designed by Brunel, was perfected, constructed, and applied by Mr. Maudslay's father, in such a way that by the first year's use a degree of economy was effected to the extent of £24,000. Mr. Thomas Maudslay worked hard during his youth. After assisting in the construction of machinery, steam engines, &c., which required great skill, he went to France, and there fitted up machinery surpassing anything of the kind seen in that country. He fitted the Regent's-canal gates, which were curiosities at the time. He came with his father to Lambeth, and by patient investigation and a careful consideration of the "ways and means," he assisted in transforming the establishment, which was then but a bantling, into a gigantic engineering manufactory; and during the Crimean war there were no fewer than 1,200 men employed. He mainly assisted in cherishing, advancing, keeping together, and protecting an engineering establishment which could boast of bringing to mechanical perfection some of the brightest ornaments in the engineering world, including Whitworth, Nasmyth, and Richard Roberts. Mr. Henry Maudslay, very early in life, took his son, Thomas, to the well-known bank of Messrs. Masterman, Mildred, and Co., of Nicholas-lane, and for a period of nearly forty years he was the one who signed the cheques of the firm. Mr. Maudslay was chiefly, though not exclusively, a naval engineer. For the last quarter of a century and more he has constructed engines for some of the largest and some of the smallest vessels in Her Majesty's navy—from line-of-battle ships to gun-boats. His firm supplied the iron-cased *Royal Oak* (800 horse power), the *Marlborough* (800), the *Revenge* (800), the *Gibraltar* (800), the *Edgar* (600), the *Trafalgar* (500), the *Majestic* (400), &c.; the screw-frigate *Ariadne* (800), the *Immortalité* and *Topaz* (600 each), the *Aurora* (400), &c.; besides corvettes, screw-sloops, gun-boats, paddle-sloops, gun-vessels, and troop-ships, innumerable. The old *Endeavour* (on the Thames), H.M.S. *Lightning* (still in service, as among the earliest movements in steam ships), and, since then, the *Great Western* (which is still in the Royal Mail Steam Packet Company's Service), and H.M.S. *Terrible*, must not be omitted from the list of his works. Although one of the first of the originators of the Institution of Civil Engineers, he was of a retiring disposition, and withdrew after some years, and Mr. Joshua Field, his partner, afterwards became president. Mr. Maudslay, like many other eminent men, was the architect of his own fortune; beginning life in a humble capacity, he died the wealthy owner of Banstead Park, and the head of a firm almost identified as much with the banks of the Neva as with the banks of the Thames, a firm employing more than 1,000 hands. He was elected a member of the Society of Arts in 1815, and remained so till his death.

MEYERBEER, the eminent German composer, died on the 2nd inst., in Paris. The deceased was born in Berlin, on the 5th of September, 1794, and at the time of his death was nearly 70 years of age. As a child he was extremely precocious, and his musical talent came to him so early, that when only seven years old he was celebrated; and at nine a German critic spoke of him as one of the best pianists of Berlin. Under less favourable circumstances the lad would doubtless have been prematurely brought before the public as a prodigy, to contradict, perhaps, in manhood, the promises of his youth. But his father James Beer, a Jew banker, was very wealthy, and Giacomo Meyerbeer, as the composer afterwards called himself, Italianising his name, only appeared occasionally, principally at amateur concerts, and had plenty of opportunities afforded him for study. With what result he availed himself of them is known throughout the world. Meyerbeer did not, however, at once obtain a high position in music. His first opera, *Jephtha's Daughter*, was represented at Munich in 1812 with but indifferent success,

but the numerous works he afterwards produced, and which extended over nearly the whole range of musical composition, secured for him a wide reputation, and proved that his talents were of no common order. Of these productions the *Crociato in Egitto*, produced in Venice in 1825, may be said to have laid the foundation of his European fame. In 1831 he produced his grand work, *Robert le Diable*, and henceforth Meyerbeer was recognised as a master. The *Huguenots* followed in 1836, and the *Prophète* in 1849, both operas at once taking that commanding position on the lyric stage which they have ever since maintained. *L'Etoile du Nord*, a work in a different style, but distinguished by the same charm of genius, followed in 1854, and the *Pardon de Ploermel* still more recently. It has long been known that the deceased composer had finished another work, *l'Africaine*, and that his scrupulous, and perhaps fastidious, anxiety to secure for it a satisfactory interpretation has alone kept it from the public. Its production may now, it is to be presumed, be looked for at no distant date.

Correspondence.

VACANT NICHES IN LONDON.—SIR,—You may recollect, as I do, a caricature by Gilray, called "More pigs than teats," in which the government of that day was represented as the lady pig recumbent in the straw, and the place-hunters by a whole army of little pigs, far more in number than the teats and places they sought. This is as good as one of Æsop's fables, and I suppose will live as long. It is, however, to the reverse of this tableau that I would refer, viz., to a case in which there is a superabundance of places vacant and unoccupied—to that of the many architectural niches throughout London vacant of the features they are fitted and were originally destined to hold. It is not requisite to cite instances, for a short walk through any part of London will supply plenty. A niche is evidently an incomplete feature without a vase or a statue in it, and yet I doubt whether one-fourth of the niches in the buildings of London are occupied, and this although we may be quite sure that in the original designs, submitted and approved, of these buildings they were religiously filled with sculpture. The truth is, sculpture is used as a bait in decorating architectural designs, especially in competition, but when the design is fixed on then come the details of estimate and contract, &c., and then the first thing "knocked off" is the sculpture. It is not essential, they say, to the uses of the structure, and it can be done at any time, meaning, no doubt, that it should be done at some time, but in the event it never does get done, for unexpected extras come in, and the committee are at the end of their funds. Assuredly an unoccupied niche in a building is an absurdity as well as a shortcoming, and yet there are a vast number of them in London. In some cases they afford excellent situations for statues, for the subjects of which we cannot be at a loss while the fact exists, which it does I am told now, that neither Shakspeare, Milton, Newton, Cromwell, Locke, nor a number of our other worthies have tributes of this kind in London. Now, might not this subject fall legitimately within the province of the Society of Arts to suggest and give their countenance to, viz., the completion of some of our public buildings, by thus supplying the features originally contemplated in them, and honouring some of our worthies, who, if they had been Italian, German, or French, would long ago have had this tribute accorded them; by which means also art would be encouraged? Our bridges also have many pedestals unoccupied, as also many other architectural situations in London, among which prominently stand the four great pedestals in front of the British Museum, which were intended, I am told, to receive the statues of Shakspeare, Bacon, Newton, and Locke, but there the great unmeaning blocks have now stood for years without any excuse. To fill these niches and crown these pedestals might surely meet with some response if put properly before the public; and if marble and bronze were in some cases too expensive, then iron, stone, or terra cotta afford, I believe, nearly as good art at a lower rate. —I am, &c., COMPLETE YOUR WORK.

PATENT LAWS.—SIR,—Your *Journal* has been sent to me containing a discussion on patent law. I am not much of a speaker, so wish to write a word or two in reply to certain remarks. One gentleman said that the inefficiency of patent law was shown by the number of patents that fall through—a mere per centage passing the crucial test of public ventilation at the three and seven year stages respectively. As he spoke with vigour and fluency, let me ask the serious attention of the members and debaters on this important subject to this one reply of mine: It is this very separation of the chaff from the wheat, which is the very essence and value of the English patent system. Rotten patents fall through. But who shall say what is rotten and unsound in invention without this test? Bad patents die a natural death. Is this any reason why they should be murdered, and so, sometimes, a good life be taken.—I am, &c., W. RIDDLE.
South Lambeth, May 3, 1864.

Notes.

PROPOSED GALLERIES AT SOUTH KENSINGTON.—The Commissioners appointed to award the premiums for the designs submitted in competition for the galleries met on the 29th April for their final decision. Present:—Lord Elcho, in the chair, Mr. Tite, Mr. Roberts, Mr. Fergusson, and Mr. Pennethorne. After further examination and discussion, they awarded the first premium to the design distinguished by the motto, "*Ad ogni uccello il suo nido é bello;*" the second to that marked "To build well," &c.; and the third to that inscribed "*Pro Rege et Lege.*" This report having been forwarded to the Chief Commissioner of Works, the Right Hon. W. Cowper, M.P., and the letters opened, it was ascertained that the first premium of £400 had been awarded to Captain Fowke, R.E.; the second, of £250, to Professor Kerr; and the third, £150, to Mr. Borthwick. The decisions are stated to have been unanimous.

MEETINGS FOR THE ENSUING WEEK.

MON. ...R. Geographical, $8\frac{1}{2}$. Senor Cox, "On the Physical Geography of the region between Valdivia and La Plata, and on a newly discovered low pass across the Andes." Translated and communicated by Sir Woodbine Parish, F.R.S.
Royal Inst., 2. General Monthly Meeting.
TUES. ...Medical and Chirurgical, $8\frac{1}{2}$.
Civil Engineers, 8. M. Pernolet, "On the means of Utilising the Products of the Distillation of Coal, so as to Reduce the Price of Coke; with Descriptions of the Ovens, and of the Best Processes used in Great Britain and on the Continent in the Manufacture of Coke."
Zoological, 9.
Syro-Egyptian, $7\frac{1}{2}$. Mr. Joseph Bonomi, "On the Alabaster Sarcophagus in the Museum of Sir John Soane."
Ethnological, 8. 1. Mr. John Crawfurd, F.R.S., "On the supposed Stone, Bronze, and Iron Ages of Society." 2. Dr. Donovan, "On Empirical and Scientific Physiognomy as applied to Study of Races of Man and Individuals."
Royal Inst., 3. Professor Marshall, "On Animal Life."
WED....Society of Arts, 8. Mr. J. Bailey Denton, "On the Economy of Agricultural Cottages, considered with regard to the Interests, the Position, and the Duties of the Labourer, the Tenant-farmer, and the Land-owner."
Geological, 8. 1. Mr. T. Codrington, "On a Section with Mammalian Remains near Thame." 2. Mr. E. Witchell, "On a Deposit at Stroud, containing Flint Implements." 3. Major J. Austin, "On the Earthquake which occurred in England on October 6th, 1863." 4. Mr. Arthur Lennox, "On the White Limestone of Jamaica, and its associated intrusive Rocks."
Graphic, 8.
Microscopical, 8.
Literary Fund, 3.
Archæological Assoc., $4\frac{1}{2}$. Annual Meeting.
College of Preceptors, $7\frac{1}{2}$. Dr. W. B. Hodgson, F.C.P., "On the Report of the Commissioners appointed to Inquire into the Condition of the Public Schools."

THUR. ...Roy.. 8½.
R. Society Club, 6.
Antiquaries, 8.
Royal Inst., 3. Mr. John Hullah, "On Music (1600—1750)."
FRI.......Astronomical, 8.
Royal Inst., 8. Mr. J. Scott Russell, "On the Mechanical Use of Gun Cotton."
SAT ......R. Botanic, 3¾.
Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

PARLIAMENTARY REPORTS.

Par. Numb.

SESSION 1863.

431. (A x). Poor Rates and Pauperism—Return (A).

Delivered on April 13, 1864.

141. Railway Companies' Powers—Report and Evidence.
136. Felon's Property—Returns.
162. Watch Cases and Watches—Returns.
167. Private Bills (Petitions, &c., 1864)—Return.
181. National Education (Ireland)—Correspondence.

Delivered on April 14, 1864.

144. Malta Dock—Papers and Correspondence.
180. Poor Law (Ireland) (Kells Union)—Return.
60. Bill—Thames Conservancy.

Delivered on April 15, 1864.

19. Railway and Canal, &c., Bills (267. London, Brighton, and South Coast Railway (Steamboats); 268. London, Chatham, and Dover Railway (No. 3) (Steamboats); 269. Manchester, Sheffield, and Lincolnshire Railway (Steamboats); 270. Mersey Docks and Harbour Board; 271. Portpatrick Railway (Steamboats)—Board of Trade Reports.
42. (1). Banda and Kirwee Booty—Further Return.
78. (1). Lighthouses (Isle of Man)—Supplementary Return.
149. Electors—Return.
185. Public Income and Expenditure—Account.
193. Judgments (Courts of Common Law)—Return.
196. Foreign Bills of Exchange—Return.
169. Increase and Diminution (Public Offices)—Abstract of Accounts.
61. Bills—Church Building and New Parishes Acts Amendment.
62. — Joint Stock Companies (Voting Papers).

Delivered on 16th and 18th April, 1864.

19. Railway and Canal, &c. Bills (272. Metropolitan District Railway (No. 2); 273. Metropolitan Grand Union Railway (No. 2); 274. Tottenham and Hampstead Junction Railway; 275. Wallasey Improvement)—Board of Trade Reports.
55 (3). Railway and Canal Bills—Fourth Report from Committee.
184. Private Bills (Statement of Fees, &c. 1863)—Returns.
193. Savings Banks—Paper.
194. Queen's College (Cork)—Return.
197. Cathedrals—Return.
198. East India (Civil Service)—Return.
174. East India (Waste Lands)—Return.
166. Hainault Forest—Return.
67. Bills—High Court of Bombay.
61. ,, Partnership Law Amendment.
69. ,, Court of Chancery (Despatch of Business).
70. ,, Bridges (Ireland).

Delivered on 19th April, 1864.

80 (1). Coal—Copy of Mr. Miller's Letter.
171. Treasury Chest (1862-63)—Account.
179. Convent Schools (Ireland)—Return.
199. Shipping—Return.
66. Bill—Civil Bill Courts (Ireland) (amended).

Delivered on April 20th, 1864.

55 (4). Railway and Canal Bills—Fifth Report from Committee.
152. Holyhead Harbour—Returns.
182. Lisburn Election Petition—Minutes of Proceedings of Committee.
207. Dwelling Houses and Horses (Ireland)—Return.
209. Property and Income Tax—Return.
103 (4). Civil Services—Estimates (Class 4).

Delivered on April 21st, 1864.

19. Railway and Canal, &c., Bills (276. London and North Western Railway (Traffic Arrangements); 277. Lynn and Sutton Bridge Railway (Cross Keys Bridge), (Transfer)—Board of Trade Reports.
35. Revenue Departments—Accounts.
195. Government Houses, &c.—Returns.

Patents.

From Commissioners of Patents Journal, April 29th.

GRANTS OF PROVISIONAL PROTECTION.

Animal and vegetable substances, preservation of—713—J. Morgan.
Animals, preparing the carcases of, for curing—876—J. S. Richardson.
Boots and shoes, stamping, &c., parts of—918—A. J. Fraser and F. Squire.
Bricks, &c., manufacture of—933—T. R. Crampton.
Buckles—884—J. B. Fenby.
Buttons, &c.—922—H. Charles.
Chaff-cutting machine—924—J. C. Rohrbeck.
Cloths, manufacture of—878—D. Moseley.
Coal cellar holes, securing the lids of—920—H. and J. W. Lea.
Compasses—781—W. Arthur.
Dead bodies, embalming and mummifying—926—A. Audigier.
Engines, motive-power—227—J. Young and A. C. Kirk.
Fibrous substances, apparatus for combing—906—M. Todd.
Fire-arms, breech-loading—866—W. Hill.
Fire-resisting materials, application of—841—S. Martin.
Grain, apparatus for washing, &c.—901—T. G. Miller.
Gun carriages, checking the recoil of—880—C. A. Ferguson, jun., and T. Ferguson.
Guns, working of—823—J. Walker.
Iron, &c., compositions to prevent the oxidation of—341—B. Todd
Jute, &c., preparation of, for hackling, &c.—908—J. Ferrier.
Machinery, lubricating—886—R. Thatcher.
Metal plates, hammering and planishing—892—J. Howell.
Metals, apparatus for rolling, &c.—896—J. Dodge.
Minerals, grinding or pulverising—868—C. J. L. Leffler.
Ordnance, &c.—182—T. C. Clarkson.
Pipes, tubes, &c., joints for—354—W. Hawthorn.
Ploughs—916—J. B. Alliott.
Powder flasks, construction of—910—F. A. P. Pigou.
Railway brakes—693—F. Dancart.
Railways and tramways, construction of—577—H. Greaves.
Ships, &c., apparatus for steering—3222—F. H. Fitz William.
Ships, &c., propelling, navigating, &c.—89—W. Welch.
Ships, preserving the bottoms of—928—J. C. Evans and J. C. Thompson.
Small arms and ordnance, sights for—883—F. C. Goodwin.
Spirituous liquors, &c., purification, &c., of—791—T. J. Smith.
Steam, apparatus for condensing—904—W. E. Gedge.
Steam boilers, apparatus for cleaning tubular—872—H. A. Bonneville.
Steam boilers, furnaces for—902—A. T. Becks.
Steam ploughing—934—J. Cope.
Strands, apparatus for covering—890—M. Simpson.
Vessels, apparatus for propelling—874—A. Rigg, jun.
Wire, gold and silver—898—B. X. Richard and R. Radisson.
Wood, ivory, &c., cutting, shaping, &c.—888—T. S. Martin.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Locomotives, adhesion of driving wheels to rails—1046—Sir C. Fox.
Metallic nuts, machinery for manufacturing—966—G. Haseltine.
Nail-cutting machine—1048—F. Bush.
Presses—978—G. T. Bousfield.

PATENTS SEALED.

2718. S. Bateman.	2743. J. Whitworth.
2723. P. A. Sautreuil.	2755. C. H. Southall and R. Heap.
2724. G. Ville.	2783. G. T. Bousfield.
2725. J. Thomas.	2799. J. Smith.
2726. E. Hughes.	2821. G. H. Brockbank.
2727. E. Howe, jun.	120. D. A. Burr.
2729. R. Brooks and C. Inwards.	141. D. A. Burr.

From Commissioners of Patents Journal, May 3rd.

PATENTS SEALED.

2740. B. Blackburn.	2794. J. Mash.
2753. J. Muckart.	2796. S. Faulkner.
2758. J. Townsend.	2832. W. F. Dearlove.
2759. W. M. Neilson.	2838. M. A. Muir & J. McIlwham
2763. R. Johnson.	2886. W. Williams.
2764. W. E. Newton.	2906. R. Walker, J. S. Walker, and B. Brown.
2765. H. L. Emery.	
2768. J. K. Hoyt.	2930. H. Ayckbourn.
2769. J. Johnson.	2945. J. Smith.
2774. A. Prince.	2946. E. B. Wilson and J. Imray.
2775. A. Barclay and A. Morton.	2956. J. H. Johnson.
2780. A. A. L. P. Cochrane.	2961. P. Tait.
2782. W. J. Cunningham and H. Connop.	2981. F. Page.
	2989. P. Gaskell.
2784. N. Thompson.	3168. H. Chadwick and J. Clench.
2791. S. J. Bartlett.	8. W. Allen and W. Johnson.
2792. H. A. Bonneville.	18. W. Hall.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1060. J. Poole and W. Milward.	1304. W. E. Newton.
1064. T. W. Miller.	1075. W. Johnson.
1107. W. Clissold.	1190. J. F. L. Baddeley.
1179. I. M. Singer.	1221. R. Hornsby, jun.
1295. T. Aveling and H. Rawlinson.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1200. D. Chadwick and H. Frost. | 1218. S. Mortimer.

Registered Designs.

Butter Dish—4631—April 30—Thos. Geo. Webb, Manchester.
Butter Dish—4632—April 30—Thos. Geo. Webb, Manchester.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, MAY 13, 1864. [No. 599. VOL. XII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

MAY 18.—"On Oyster-Culture." By JAMES LOWE, Esq., Joint Secretary of the Acclimatisation Society of Great Britain.

May 25.—Derby-day. NO MEETING.

CANTOR LECTURES.

On Thursday evening, the 5th May, Dr. Crace Calvert, F.R.S., delivered the last lecture of his course, and at the close

The CHAIRMAN begged the meeting to bear with him a few minutes while he asked them, in the name of the Council, and he hoped he might say in the name of all present, who had attended Dr. Calvert's lectures, to thank him for the very interesting course which he had that evening completed. He did not propose to thank Dr. Calvert for the information he had, in so lucid and interesting a manner, conveyed to the audience, for that was his special duty; but he wished to mark strongly their sense of the able manner in which he had conveyed to his hearers the great variety of details contained in his lectures; for the graphic manner in which he had explained the various processes and manufactures he had described, and the very clear and conclusive reasoning with which he had applied his facts to the every-day business of life. Everyone must regret the termination of the course, and they could not but hope that, as these Cantor lectures had proved so attractive to the members of the Society and their friends, they would again have the opportunity of hearing Dr. Calvert lecture upon many branches of manufacture which he had not been able to touch upon during the present session. With these observations, he would propose a vote of thanks to Dr. Calvert.

The vote of thanks was unanimously passed.

In the course of the lecture Dr. Calvert had called attention to the metal Magnesium, exhibited some wire made from it, and pointed out the brilliant light which its combustion affords, as specially adapted for illuminating objects for being photographed. M. Claudet, in the presence of the audience, took several successful photographs of the bust of the Prince Consort in the anteroom, lighted by this agent, the time of exposure to the camera not exceeding thirty seconds.

The manufacture of this metal, it was stated, had been undertaken by Messrs. Johnson and Matthey, who would shortly be prepared to supply the wire at the rate of 21s. per oz., or a length of 120 feet.

A complete report of Dr. Calvert's lectures is in the course of preparation, and will appear in the *Journal*.

COTTAGES FOR THE LABOURING CLASSES.

The various plans sent in, in competition for the prizes offered by Mr. J. Bailey Denton, through the Society, are now hung on the walls of the meeting-room, and may be inspected by the members and their friends.

A Special Conference will be held at the Society's House, on Thursday, the 26th, and Friday, the 27th of May, to which the Council invite all those members of the Society of Arts who have seats in the Legislature, such other members as are known to take a special interest in the subject, the Presidents of the Institutions in Union with the Society, and other noblemen and gentlemen whose co-operation may be deemed important.

The Conference each day will be opened at 11·30 *precisely*, and closed not later than 4 o'clock, the chair being taken by the Chairman of the Council.

The discussion will be taken:—

1. On the insufficient number of habitations for the labouring classes in town and country.
2. On the badness of the existing accommodation.
3. On the effects arising from this state of things, viz.:—
   - (*A*) Religious, moral, and social.
   - (*B*) Sanitary.
   - (*C*) Economic.
4. On the causes to which these evils may be, or have been, attributed, such as—
   - (*A*) The Law of Settlement.
   - (*B*) The Poor Laws.
   - (*C*) Tenure of property, such as mortmain, leasehold system, tenancy for life, &c.
   - (*D*) Legal difficulties affecting the transfer of property.
   - (*E*) Difficulty of providing proper dwellings at a cost which will be remunerative to capital in town and country.
5. Remedies:—
   - (*A*) What can be done by Legislation?
   - (*B*) What can be done without Legislation?
   - (*C*) What assistance, if any, can the Society give in either of these directions?

STATISTICS OF MODEL DWELLINGS.

The report of the Committee appointed by

the Council to consider this subject, consisting of the Hon. and Rev. Samuel Best, Mr. Samuel Gregson, M.P., Mr. Chandos Wren Hoskyns, Mr. Thomas Twining, Mr. Henry M. Eyton (architect), and Mr. George C. Rigby (builder), has been published, and any member of the Society interested in the subject may have copies on application to the Secretary. This inquiry was originated at the suggestion of Mr. Twining, who has also kindly defrayed the expenses of it, and of the publication of the report.

Proceedings of the Society.

TWENTY-FIRST ORDINARY MEETING.

Wednesday, May 11th, 1864; Wm. Hawes, Esq., Chairman of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Barnett, Henry, 15, Halkin-street West, W.
Boutcher, Emanuel, 12, Oxford-square, W.
Briggs, George Walker, 45, Wigmore-street, W.
Clarke, Ebenezer, jun., 78, Cannon-street West, E.C., and Walthamstow, Essex.
Jones, James Valentine, 21, Cambridge-road, Islington, N.
Kibble, Thomas, L. 3, Albany, Piccadilly, W.
Owen, Rev. Joseph Butterworth, M.A., 40, Cadogan-place, Chelsea, S.W.
Wilson, John Guy, 109, Market-street, Manchester.

The following candidates were balloted for and duly elected members of the Society:—

Buss, Thomas O. L., 33, Hatton-garden, E.C.
Chifferiel, Frederick, Dulwich, S.
Clarke, John Joseph, 54, Chancery-lane, W.C.
Hook, A. Clarke, Worcester-park, Kingston, S.W.
Hook, F. C., Pinewood, Witley, near Godalming, Surrey.
Jeffries, George, Woolwich, S.E.
Kirkman, Gardinelli S., 27, Claremount-terrace, Fentiman's-road, South Lambeth, S.
Lefeuvre, W. H., 18, Great George-street, S.W,
Martin, C. Wykeham, 25, Cumberland-st., Hyde-pk., W.
Ordish, R. M., 18, Great George-street, S.W.
Parkyns, Sir Thomas G. A., Bart., 9, Gloucester-sq., W.
Reibey, Archdeacon T., 38, Gloucester-ter., Hyde-pk., W.
Smith, W., 11, Staple's-inn, Holborn, E.C.
Stephens, Gilbert, 13, Northumberland-st., Strand, W.C.
Thompson, C. Edw., 8, Colet-place, Commercial-road, E.
Webb, Francis, 31, Southampton-buildings, Chancery-lane, W.C.

The Paper read was—

THE ECONOMY OF AGRICULTURAL COTTAGES, CONSIDERED WITH REGARD TO THE INTERESTS, THE POSITION, AND THE DUTIES OF THE LABOURER, THE TENANT FARMER, AND THE LAND-OWNER.

BY J. BAILEY DENTON, ESQ., M. INST. C.E.

With a view to discuss the object before us in the most practical manner, I propose to consider the subject of the economy of cottage-building under the following distinct heads:—

1st. The cost of cottages, as influenced by sanitary requirements and considerations of durability.

2nd. How far the improvement of the dwellings of agricultural labourers may be advanced by a modification of prevailing views, without detracting from healthiness and comfort; and

3rd. The advantages gained by the labourer himself, his immediate employer, and the owner of the land upon which his labours are expended, by the erection of good dwellings placed in judiciously-selected situations.

It should be premised that the subject under consideration is confined to Rural Cottages—the dwellings of agricultural labourers and their families—and does not extend to houses in towns, the dwellings of artisans, mechanics, shopmen, and workmen engaged in commerce and trade. To place the dwellings of these two classes of our industrial population on the same footing, would defeat the object we have before us.

The economy of the two can only be fairly discussed by keeping them separate; for to look at them in the same light we must assume that urban and rural labourers have the same income and earn the same wages, which is not the case. We should extend these prefatory remarks too far if we went into a comparison of wages, and the profits of agriculture and trade upon which wages are necessarily based; but it may be safely stated that whereas the average wages of farm labourers in England and Wales do not reach 11s. a week, the wages of artisans, mechanics, shopmen, porters, and others employed in towns, amount to at least 24s. a week, arising from the fact that the average profits of trade are at least double those of farming, for which there are, of course, many reasons, the principal one being that the trader's capital is generally turned over more than once in the year, while the farmer's capital is with difficulty restored to him within the year.

The cost of cottages is made the first object of consideration, because it is practically found that although all persons interested in the question admit the present bad condition of things, very few, comparatively, are found willing to improve it, for the simple reason that the outlay does not command that direct profit which attends other investments.

Decoration and ornament often form serious items in the outlay, and, unfortunately, often detract from utility; but as these are objects foreign to our present purpose, they must be excluded from consideration. Good judgment in cottage building is best displayed by neatness and simplicity. It is very possible to depreciate the value of landed property by building unsightly cottages, erected in defiance of good taste and in opposition to all rules of proportion.

The cost of agricultural cottages necessarily depends on the amount of accommodation they afford, and the strength and substantiality of the structure itself. The extent of accommodation which rural cottages should possess has recently been somewhat arbitrarily determined on sanitary grounds. The miserable hovels in which large families were crowded, and which still unfortunately exist, to the disgrace of our country, have called forth the indignation of all right-minded men, and we have been gradually led to conclude that no cottages are suitable unless they contain five living rooms, of which three are bed-rooms, of prescribed dimensions, with minor offices.

The principles upon which these dimensions of space have been determined are not very distinctly acknowledged, as will be seen by an examination of the views of different authorities and the regulations of different institutions. These show that the space considered necessary to maintain health in dwellings varies from 240 to 1,500 cubic feet for each person.*

* The following remarks are extracted from Mr. Henry Roberts' pamphlet, entitled, "Healthy Dwellings, and prevailing sanitary defects in the Houses of the Working Class," pp. 19 and 20. *Space Required.*—The cubical space required to keep a healthy man in full vigour is a question of much importance, and one on which very different opinions have been expressed. Experience gained in poor-house dormitories, prisons, &c., has led to the conclusion that from 450 to 500 cubic feet are requisite, and that the ventilation should be such as will cause an entire renewal of the air about once in the hour. Observations made at the model lodging house in George street, St. Giles's, which is a confined situation, satisfy

According to Dr. Arnott—perhaps the greatest authority on this subject as connected with ventilation—the actual quantity of air respired by an adult human being amounts to 300 cubic inches per minute—not quite one-sixth of a foot, or 240 cubic feet in the course of the day, while the total quantity of air, directly or indirectly vitiated during the same period, is 2,880 cubic feet. Tredgold, however, states the amount of air respired by an individual to be as much as 800 cubic inches per minute, or nearly half a cubic foot, while the total quantity vitiated during 24 hours he considers to be at least 4,320 cubic feet.

These figures are quoted to show the wide difference of opinion which has been expressed by high authorities on the vital point of respiration; and if we examine the views practically carried out at our various national institutions in the space given to each person, we shall find parallel instances of diversity. For example, the space admitted to be sufficient by the police authorities under the Lodging-house Act is 240 cubic feet per person; in the dormitories of the barracks of our army the quantity deemed sufficient has been 500 cubic feet, although the Commission on Warming and Ventilation to the General Board of Health urged that this space should be increased to 700 or 800 cubic feet per man. In hospitals, where extra reason exists for large space, the amount varies from 1,000 to 1,500 cubic feet each person; in the prisons 800 cubic feet seems to be the recognised space, and in the model lodging houses about 550 cubic feet is given.

In spite of this prevailing diversity, experience enables us to adopt with security for cottages the following dimensions of space:—

Height of lower rooms, 8 feet; height between floor and ceiling of upper rooms, 7 feet 6 inches.

Lower Rooms.			
Living room	Area, 150 ft.—	Cubic contents	1200 ft.
Scullery	,, 80 ft.—	,, ,,	640 ft.
Upper Rooms.			
Parents' Bedroom...	Area, 120 ft.—	Cubic contents	900 ft.
Boys' ,, ...	,, 90 ft.—	,, ,,	675 ft.
Girls' ,, ...	,, 80 ft.—	,, ,,	600 ft.

The ventilation which will render these spaces sufficient is gained by having a fire-place and window in each room, with the door entering directly from the porch, passage, or stairs. Practically, all minute refinements in the art of ventilation are found inapplicable. In addition to these desiderata, each cottage should be provided with a pantry within the dwelling, having a command of a free passage of air through it. The scullery, and not the living room, should have a copper and sink for washing, which should be the property of the owner of the cottage; an oven is a desirable addition, but it is not essential. The out-offices should consist of a small barn, for wood and coal; a privy detached, with facility for emptying it; and an ash-pit, so connected with the privy that the ashes may be used to prevent effluvium. The whole premises should be perfectly drained. All the roof-water should be preserved, and a command of well-water should be provided also. The yard and walks (if any) should be paved or gravelled, so as to preserve cleanliness within the dwelling.

These details of accommodation shortly supply the sanitary data upon which cottages of the best class should be built.

To avoid any difference of opinion as to the proper degree of substantiality to be adopted, it should be borne in mind that a very large proportion of the landed property of the country is held by tenants for life, and that it is of the highest importance that all buildings erected by them should have equal reference to future maintenance as to present cost, for no owner is justified—especially if he charges his estate with the cost—in putting up buildings of any character which shall be a cause of constant repair. This remark applies to all agricultural buildings, but most particularly to labourers' cottages, though instances are not wanting in which land-owners, to gratify a passing impulse, have raised upon their estates a number of flimsy habitations, sometimes adorned with questionable taste, which their successors are maintaining at a greater annual outlay than the rent derived from them.

If a land-owner, whose interest in his estate is limited to his own life, desires to borrow money for the building of cottages, in the same way as he is empowered by the legislature to borrow for the building of farm-houses, or as an incumbent of a living can borrow for the building of a rectory house, he must conform to certain rules. In the case of farm-houses and labourers' cottages, these rules are furnished by the Inclosure Commissioners for England and Wales, who are appointed under the several Agricultural Improvements Acts, to protect reversionary interests against the misapplication of money, and to see that cottages, of which the cost is charged on estates, are built according to the rules laid down by them. Objections have been raised by landowners and by architects to the requirements of the Inclosure Commissioners, on the ground that the rejection of home-grown timber is too arbitrary, and that the dimensions of the scantlings are unnecessarily large, but no sufficient reason has yet been recognised for departing from them. It may be a question for owners in fee to consider whether these rules are such as it may be expedient for them to adopt, when not charging their estates, but it will be clear, on examination of the rules referred to, which are printed in the form of a circular, that in all cases of entailed property the conditions recognised by the Commissioners are sound, and ought to be adopted by all tenants for life, whether they borrow money and charge their estates or not. If this be admitted there is the least possible room for difference in the cost of cottages of the same class. Yet there is no subject, perhaps, which has elicited such variety of opinion, and such diversity of designs and estimates. If we examine the Journal of the Royal Agricultural Society of England, we shall see conclusive evidence of this fact. In one case, that of Mr. Young Macvicar (prize design 1849), the amount of his estimate is honestly given at £296 9s. 8d. the pair, while in another instance a subsequent prize was given in 1856 for precisely the same object, the estimate of which is £170 the pair.

Were it possible to erect a pair of cottages, with the same accommodation, and with the same degree of substantiality, with such a saving us here quoted, there is no

me that the cubical space of 535, which is provided in the dormitories of that building for each inmate, is, with proper ventilation, abundantly sufficient to render them healthy; such was proved to be the case even when the cholera raged in the neighbourhood, and had not a single victim out of the 104 men who lodged within its walls. From this fact I think it reasonable to infer that the cause of unhealthiness in the Wellington Barracks, where the cubical space per man allowed in the dormitories is stated to be 500 feet, must be caused, not by want of space, but by some other existing evils, particularly defective ventilation, pointed out in the Report made to the General Board of Health by the Commission on Warming and Ventilation. *Mistakes with regard to Space.*—As mistakes with regard to space may create imaginary difficulties, and either impede sanitary reform, or cause a serious unnecessary expenditure, I think it of use to notice an error on this point, made in a recent article on "Labourers' Homes," in the *Quarterly Review*, where it is stated that the Lodging-house Act requires an allowance of 700 cubic feet per person. On inquiring of the Assistant Commissioner of Police as to the fact, I learned "that 30 feet superficial is the space allowed to each lodger, in the metropolitan common lodging-houses, the rooms averaging 8 feet high [which is equal to 240 feet cube], and that 50 feet superficial is allowed to each police constable lodged in a station or section house, the rooms on an average being 9 feet high" (which is equal to 450 cubic feet). The Poor Law Board, without laying down a fixed rule applicable to all circumstances, adopts as a basis of calculation, an allowance of 500 cubic feet for every person in the sick wards, and 300 cubic feet for every healthy person in the dormitories.

doubt the country would gain a great advantage, but by comparing the details in the two cases it will be found that if the same prices were paid for labour and materials in each, the latter design, which is represented to be the cheaper by more than £125, would, in fact, turn out to be the dearer of the two. This instance is given to show that the parent Agricultural Society of England, whose desire in offering these special prizes could only have been to forward the object now before us, has been led to award them without that close examination which alone can determine the value of competitive estimates, and the omission of this essential duty has been to retard rather than to advance the progress of cottage building.

The Yorkshire Agricultural Society, having offered prizes for the same object in 1858, received 76 designs for double cottages, to be built at a sum not exceeding £200 the pair; and in 1861 the same society again offered prizes, and received 149 plans for double cottages not to exceed £220 the pair, and 69 for double cottages not to cost more than £180 the pair. Upon these competitions two very careful reports were written by Mr. C. W. Strickland. In that of 1861 the prizes were awarded to Messrs. Richardson and Ross, of Darlington, for the cottages to be erected at £220 the pair; and to Mr. J. B. Corby, of Stamford, for the plans of cottages costing £180 the pair. They each exhibit very considerable merit, and have been adopted by landowners in various parts of the country. Mr. Holland, M.P., of Dumbleton, contracted with Mr. Hunt, of Evesham, for the erection of several pairs upon the plan (No. 1) of Messrs. Richardson and Ross, whose published estimate was £210 14s. 1d. the pair. They are very well executed, but in some few particulars, such as the use of spruce for the floors of the bed rooms, and elm for staircases, are at variance with the requirements of the Inclosure Commissioners. Mr. Hunt's description of the construction, and his statement of facts are as follows:—

CONSTRUCTION.

The cottages are built with red bricks, made upon the estate, those for the plinth and jambs of windows and doors of back elevation being moulded for the purpose.

The dressings to the windows are of Bath stone. The floors to the living rooms and entrance passages are of blue stone, tooled, with steps at entrance and back doors of same material.

The floors of sculleries and pantries are of red squares, also made upon the estate. The floors of outhouses are brick on edge.

The roofs are covered throughout with Broseley tiles, the gutters and ridges being of same material; the gable ends are filletted with cement.

The eaves are spouted throughout with cast iron spouting, with down pipes of same material, and the water equally divided and conveyed into a tank sunk below the surface to supply each cottage with water.

The timbers throughout are red deal, that to the roofs in sight being wrought and stop chamfered.

The floors of bed-rooms are of spruce deal.

The staircases are constructed with elm.

The window frames and casement sashes are made of red deal, one compartment in each window being hung. The door frames and doors throughout are also made with red deal. Skirtings of wood to the bed-rooms, and cement ditto to living-rooms and passages. Pantries fitted up with shelves.

Plastering to the whole of the rooms except walls of sculleries and outbuildings, those being grouted with lime only.

The windows are glazed with thirds sheet glass, and the whole of the wood work usually painted receives three coats.

Each pair of cottages are properly drained, gardens levelled, and paths formed and gravelled, pitched causeways at back leading to outhouses and approach gates.

The contract amount for the erection of each pair, including every description of labour, materials, and all hauling, was £250 a pair.

It should be understood that bricks were near at hand, and charged at 25s. per 1,000; rubble was also obtained from the brickyard, for concrete to foundations and filling to garden paths, at 1s. per cart load. Sand also was had for raising off the estate, also gravel for foot paths, and that the contractor lost £20 upon each pair built. I do not think it possible to build cottages of this description, to cover everything, for a less sum than £270 per pair.

GEORGE HUNT.

Evesham, 6th January, 1864.

Mr. Joseph Yorke, of Forthampton, Gloucestershire, has erected some cottages on Mr. Corby's plan, the estimated cost of which was £178 11s. 5d. the pair, and he has taken every care, by the employment of his own workmen, to reduce the cost to a minimum. The actual cost, exclusive of extras for ornamental chimneys and window labels, and exclusive of the out-buildings and tank, has been £209 1s. 3d. The work has been since measured and valued by a local builder, and his figures amount to £222 4s. 2d. for the same thing, showing that by the employment of the estate workmen a saving of £13 2s. 11d. was effected.

These results prove that, although a careful examination of the designs was made by the Yorkshire Society, the estimates of the prize designs would not stand the test of practical experience, and that 25 per cent. on the estimates must be added to arrive at the actual cost. These remarks are not meant to reflect upon the professional men who have furnished designs, and who have doubtless expressed truthfully their own convictions, but they are intended simply to disclose facts which have acted prejudicially to the advancement of cottage building. It may be stated in general terms, that where the accommodation afforded is precisely the same, and the same degree of durability is aimed at throughout, there cannot be a greater difference in any designs beyond £10, or at most £15 per pair of cottages, always assuming that the circumstances are the same with respect to the employment of tradesmen by contract, who may fairly claim tradesmen's profit, or the employment of estate journeymen, whereby the tradesmen's profit is saved.

The number of cottages built in pairs, with three bedrooms each, within the last ten years, upon the principles respecting accommodation and construction here explained, the particulars of which I have taken pains to ascertain, afford a close approximation to a general average of cost.

Including outbuildings, and the formation of a tank for roof-water, that cost is found to be £270 the pair. This price represents the cost at which a builder will undertake the work, and it is possible, by employing the estate journeyman, to reduce it to £255. This amount will necessarily vary with local circumstances and the cost of materials, and will be increased further by the expenses attending the borrowing of money and the inspection of the Inclosure Commissioners, in those instances where tenants for life resort to this mode of effecting their wishes. This price is independent of the land upon which the cottages are built, which, nevertheless, forms an important item of cost. In the consideration hitherto given to the subject, and in the estimates generally furnished with the prize designs, no notice has been taken of this point, although it is one which must be considered, if we are to regard cottage-building as a proceeding worthy the attention of capitalists as well as land-owners.

Thus, it is not at all improbable that the total cost may frequently reach £300 the pair. Where a landowner adopts the plan of borrowing money, and undertakes to repay it by instalments in thirty years, with interest, he must look to a return, in one shape or another, of at least 6 per cent. per annum. In fact, under any circumstances, the return, in one shape or other, for cottage-building, should be this per-centage, to render the outlay a discreet one, for cottages are perishable, and the first cost must be regained in a given number of years, to enable the owner to replace them.

On a pair of cottages costing £300, therefore, the return

to be looked for is £18 a-year, or £9 each cottage. This is equal to 3s. 6d. per week.

The foregoing remarks were written before the issue of the report of Messrs. Hayward, Clutton, and Dines, the gentlemen who have so well and so kindly performed the office of judges of the plans recently sent in to this Society in competition for the prizes offered; and, as their decision confirms the opinion here expressed. I cannot do better than quote it:—

"In fine we may observe that although good cottages may possibly be erected, under favourable circumstances, in some parts of England for a lower sum, we consider the probable average cost of a pair of cottages built with the conveniences we have enumerated would be about £280 to £300, and that the attempt to erect them at any considerable reduction upon this amount must result in some inferior kind of buildings, discreditable to the owner, and wanting in much of the necessary accommodation for a labourer and his family."

We will now consider how far the rules generally accepted on sanitary grounds may be modified to meet the varying conditions of the labourer, and thereby secure more extended accommodation. No one can deny that in all cases where families of labourers consist of children of both sexes, it is essential to decency that three bed-rooms should exist, but the possession of this advantage is so often abused, and so difficult to adjust to the actual condition of village populations, that it becomes us to consider whether we are not straining too much after one character of dwelling, while there are others which deserve equal attention, and which if they received it would secure a more perfect fulfilment of our good intentions.

The argument used in favour of building no other than cottages with three bed-rooms is, that there already exist so many dwellings with deficient accommodation that it behoves us to supply a full number with a maximum amount before we descend to less. This view would be sound if it were not known to all experienced men that, owing to the difficulty of allotting suitable habitations to different-sized families, and the impracticability of shifting families already in possession of dwellings to fit prescribed rules, half the newly erected cottages are misappropriated. It is found, in fact, to require the harshness of positive compulsion to remove a large family out of a small hovel into a full-sized cottage, while a well-to-do labourer, with a tidy wife and no children, will greedily seize a cottage with more bed-rooms than he can occupy, in order to secure the comforts of a new structure. The motive which actuates each is explained by the circumstance that while both are equally able to work, the man with few or no children is better able to pay for increased accommodation than the man with a large family. For the same reason, when a labourer with a large family does occupy a cottage with three bed-rooms, he is frequently found to crowd his family into two rooms out of the three, and to let the third.

It will be readily understood that a labourer without children, when once in possession of a new cottage, may, by letting a part to a respectable lodger, gain increased comfort without any material addition to his rent, and with positive advantage to others. It is for these reasons that the practice of taking lodgers, reprehensible on many grounds, is found to be so difficult to prevent, and that first-class cottages are so seldom appropriated in the way intended.

It is known, too, by those that are practically acquainted with the management of estates, that it is not always possible to induce cottage tenants to appropriate the rooms of the cottage to the purposes for which they were intended, and that it frequently happens that while a large family will crowd itself into the scullery and make that apartment their living room, the living room itself is converted into a laundry or an onion chamber.

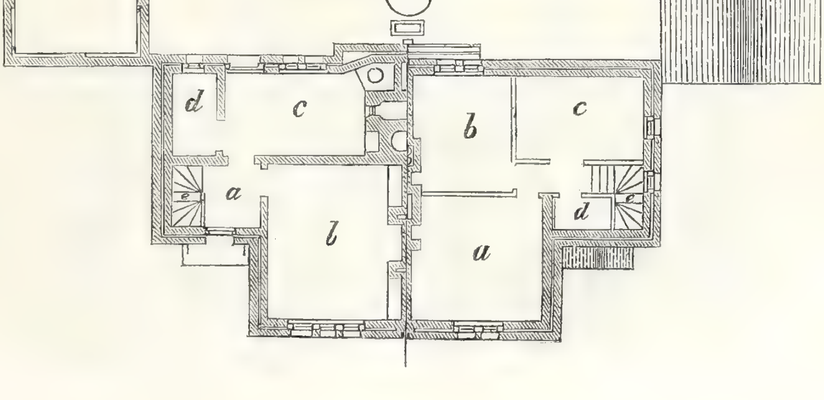
To overcome these several difficulties, however, is the duty of those who possess and those who manage landed property, but it is only by modifying the views at present prevailing, and by the greatest perseverance in enforcing an adjustment, that it can be done.

The modifications to be sought are not the reduction of space in the required rooms nor in the dimensions of walls and timbers, but in the establishment of a better and more certain mode of assorting the dwellings to the circumstances of the labourer. It will not be by any refinements in the mode of building, nor by the substitution of concrete walls for brick walls, nor hollow walls for solid ones,* that the real difficulty can be removed.

* We may, with benefit, study to increase the labourers' comforts, without increasing the expense in the cost of their dwellings, and this has already been partly done in the attainment of dryness by means of hollow walls. A very good specimen of cottage so built (see wood-cut below) has been erected for the Earl of Pembroke, near Wilton, by Mr. Robson:—

Ground Floor.

a Porch.
b Living room.
c Scullery.
d Pantry.
e Stairs.
f Wood and coal.
g Piggery.
h Privy.



Chamber Floor.

a 1st Bed-room.
b 2nd Bed-room.
c 3rd Bed-room.
d Closet.
e Stairs.

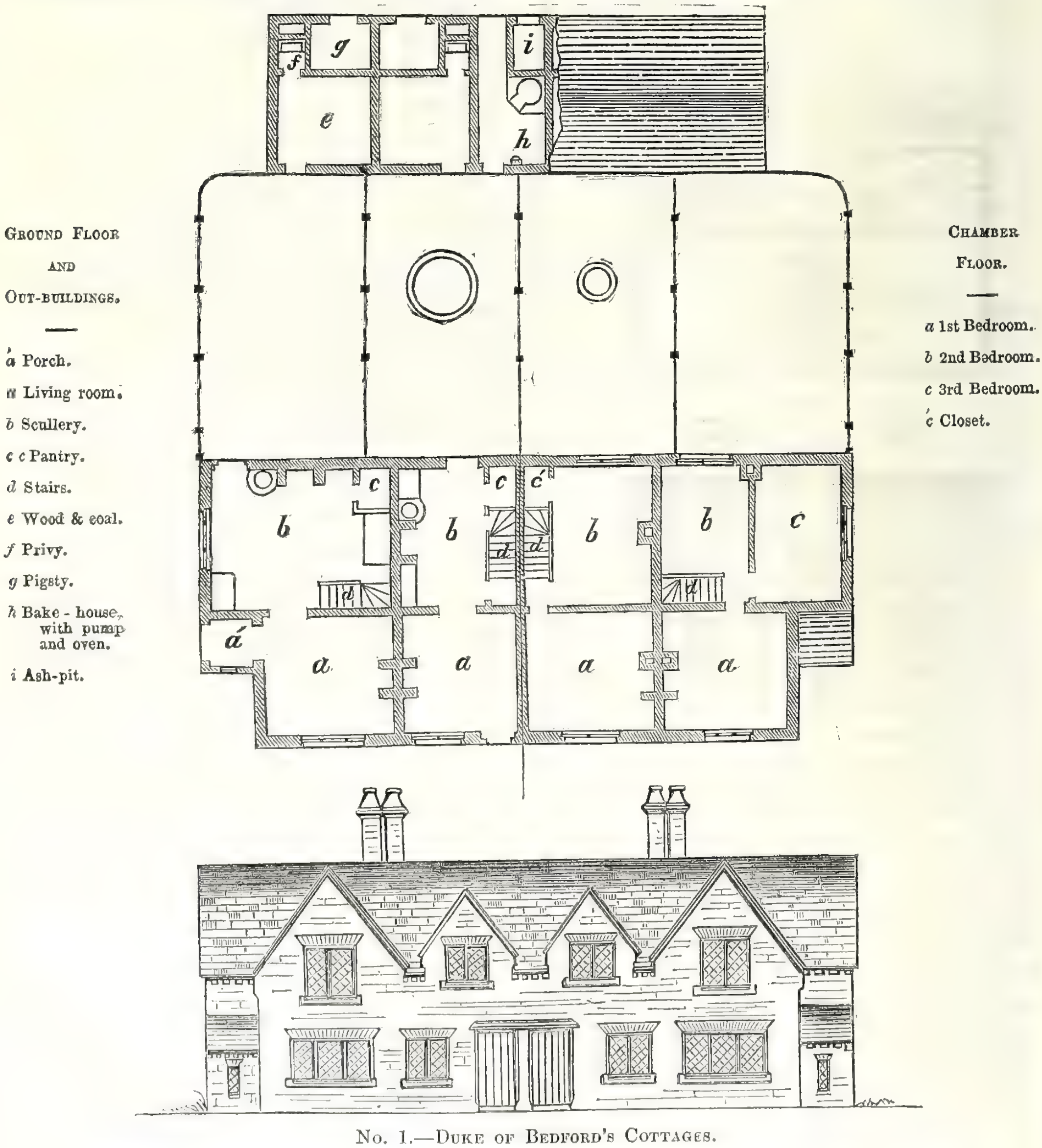
The ordinary description of hollow walls are shown in the several drawings on the walls. They are each subject to some objection on architectural grounds, which will be manifest on examination, but as all are found sufficiently strong and durable, and the advantages will outweigh the objections, principle will probably give way to expediency.

It is admitted on all hands that the rent due for cottages is the great difficulty we have to contend with; and as a larger structure of equal durability and convenience must always cost more to build than a smaller one, it is self-evident that if we are to adjust cottage accommodation to the requirements and circumstances of farm labourers, the adoption of one uniform size of cottage is the way to defeat the object. Moreover, as it happens that labourers, having the largest families and requiring the most accommodation, are those that can least afford to pay for it, it is equally clear that we must encourage every other means at command of providing for them than by the erection of new cottages. The alteration of existing cottages appears to be the better way of meeting the difficulty.

According to the population returns of the Census of 1861, the number of individuals constituting families of the sizes mentioned below appears to be in the following proportion; of course these figures represent only those families specially selected to illustrate the point before us:—

Population of the District.	Families.
69,397	768 families, consisting of married persons with five children.
	1,378 do., with three children.
	1,839 do., with one child.
	1,614 do., with no children.

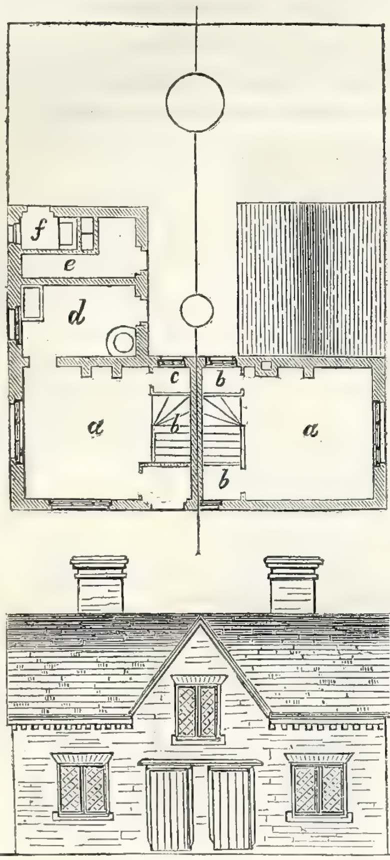
With these figures before us, it is manifestly clear that dwellings should be provided of different sizes and accommodation in something like the same proportion.



No. 1.—Duke of Bedford's Cottages.

This block of Cottages is furnished with a drying ground for each tenement, and has a common rain-water tank and well.

The late Duke of Bedford, in 1849, published, in the Journal of the Royal Agricultural Society of England, the designs and particulars of the several kinds of cottages he was erecting on his Bedfordshire and Devonshire estates. He had directed his surveyor to prepare plans of cottages, suitable for families of different sizes, singly and in blocks, and some most excellent designs will be found in the tenth volume of the Agricultural Society's Journal. Among them will be found the following plans:—No. 1 (see preceding page) shows a block of four cottages, in which two have two bed-rooms, and two, three bed-rooms each. No. 2 shows a pair of cottages, in which each has a single bed-room.



No. 2.—DUKE OF BEDFORD'S COTTAGES.

GROUND FLOOR.—*a*, living room. *b*, stairs. *c*, cupboard. *d*, scullery. *e*, wood and coal. *f*. privy. CHAMBER FLOOR.—*a*, bedroom. *b*, closets. These cottages are furnished with drying grounds, and have a rain water tank and well in common.

On Sir Henry Dashwood's estate, in Oxfordshire, may be seen some excellent cottages (see page 426), which contain three bed-rooms, but one is placed on the ground floor and two above, and scullery, pantry, &c., form a lean-to. The Cottage Improvement Society have issued a design with a similar arrangement of rooms, with the exception that the bed-room occupies the lean-to, in the place of the scullery, and has no fire-place in it; the plan, therefore, cannot be considered so good as that adopted at Kirtlington. They are figured below in juxta-position.

Captain Dashwood, under whose direction the cottages on the Kirtlington estate were erected, thus explains the advantages of the design:—"The downstair bed-room is adopted because it is found that a farm labourer, though requiring a third bed-room at one stage of his family's growth, does not require it for any length of time, as his family are either very young or, as soon as able, go out to service. The ground-floor bed-room can, at such time, be used for a lodger; or when the parents get old they can retire to this room and admit a married child, or even another couple, to help to pay the rent. The old woman, by looking after the children, enables the young wife to attend to work, and the old man can help to gain a living by doing duties which frequently devolve on children to the loss of their education.

"The advantages of this plan are—

"First—That of enabling old and young people to reside under one roof, thereby securing nearly all the advantages of two cottages.

"Second—It secures greater privacy from the position of the rooms, as under ordinary circumstances the parents would sleep below and the children above, and the partition walls would be constructed of brick, and not lath and plaster, as is the case with ordinary three-roomed cottages.

"Third—It secures greater warmth and less draught; and

"Fourth, the third down-stairs room will be found available, if required, as a workshop, or as a bed-room, especially suitable for a crippled child or an aged parent."

A modification of the same arrangement of sleeping rooms is shown by the woodcut (see page 427) of a cottage designed by the writer, in which the scullery forms a small covered yard, extending from the cottage to the outbuilding. The advantage of this arrangement is, that, the yard and scullery being one, and under cover, the former is always dry, and the latter more spacious than under ordinary circumstances, while the room (*i.e.* yard) is so constructed that it cannot be misappropriated as a living room.

Some cottages, erected on the Culford estate, near Bury St. Edmonds, by the Rev. E. K. Benyon, have an arrangement with respect to the scullery which will recommend itself. Mr. Benyon says—"I have just completed these cottages at a cost under £200. I have put the bakehouse and washhouse out of doors, as this prevents any steam from getting into the bed-rooms, and the back kitchen is made small, so as to prevent its being made a living room, which I have found to be the case in some cottages that I have built, in which the larger front room has only been made use of to hang up the family photographs." The cost quoted by Mr. Benyon evidently does not include every detail. The woodcut, page 428, shows Mr. Benyon's arrangement.

Provision for married people without children, and for old couples whose children have left them, is a desideratum of importance; and the single bedroom cottage, erected by the Duke of Bedford (woodcut 3), is a very good one for the purpose. But the plan suggested by Lady Caroline Kerrison is perhaps superior, inasmuch as the bedrooms are all on the ground floor, and are therefore more suitable for old people than bedrooms upstairs.

Lady Kerrison's plan is shown at page 429.

An arrangement for the accommodation of unmarried men has been adopted in different forms, and it is quite certain that there is no branch of the subject which deserves more careful consideration, although at present it does not receive the attention it ought.

The late Prince Consort viewed this object with considerable interest, and at the Flemish Farm his Royal Highness erected a cottage specially designed for the accommodation of carters and unmarried men upon the farm.

Several instances might be mentioned where the unmarried labourers have been provided for by the erection of a number of bed-rooms under one roof, with a common mess-room, and supplied with a kitchen and offices, under the charge of a selected matron.

It is needless to say that such a provision goes far to prevent evils attending the admission of lodgers into cottages, and, as such, is worthy the attention of the philanthropist and the land-owner.

Reduced to figures, we shall find that three-bedroom

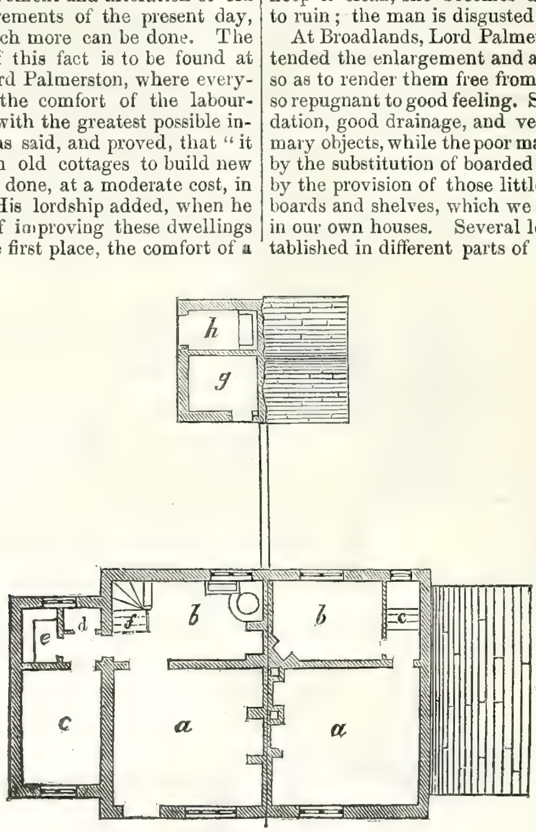
cottages will cost from £130 to £150 each; those with two bedrooms from £90 to £130 each, and those with one bedroom only from £70 to £100. The mean return required to repay principal and interest in 30 years may be taken at £8 a-year for the first, £6 12s. for the second, and £5 for the last description of cottage.

With respect to the improvement and alteration of old cottages to meet the requirements of the present day, much has been done and much more can be done. The best practical illustration of this fact is to be found at Broadlands, the estate of Lord Palmerston, where everything that can conduce to the comfort of the labouring poor has been studied with the greatest possible interest. Lord Palmerston has said, and proved, that "it is not necessary to pull down old cottages to build new ones. A great deal can be done, at a moderate cost, in improving the old ones." His lordship added, when he said this, "That the effect of improving these dwellings is almost marvellous. In the first place, the comfort of a man's house depends on the tidiness of a man's wife, and on the mode in which she tries to make him comfortable. But there is a temper of the human mind which is denominated recklessness. When a thing seems impossible, it is given up in despair. When a cottage is in such a 'ramshackle' state that it is impossible for the wife to keep it clean, she becomes a slattern; everything goes to ruin; the man is disgusted, and flies to the beershop."

At Broadlands, Lord Palmerston has personally superintended the enlargement and alteration of his old cottages, so as to render them free from those objections which are so repugnant to good feeling. Sufficient bedroom accommodation, good drainage, and ventilation have been his primary objects, while the poor man's comfort has been studied by the substitution of boarded for stone or brick floors, and by the provision of those little conveniences, such as cupboards and shelves, which we all know how to appreciate in our own houses. Several local societies have been established in different parts of England for the purpose of

Ground Floor and Outbuildings.

a Living room.
b Scullery.
c Bedroom.
d Stores.
e Pantry.
f Stairs.
g Wood and coal.
h Privy.

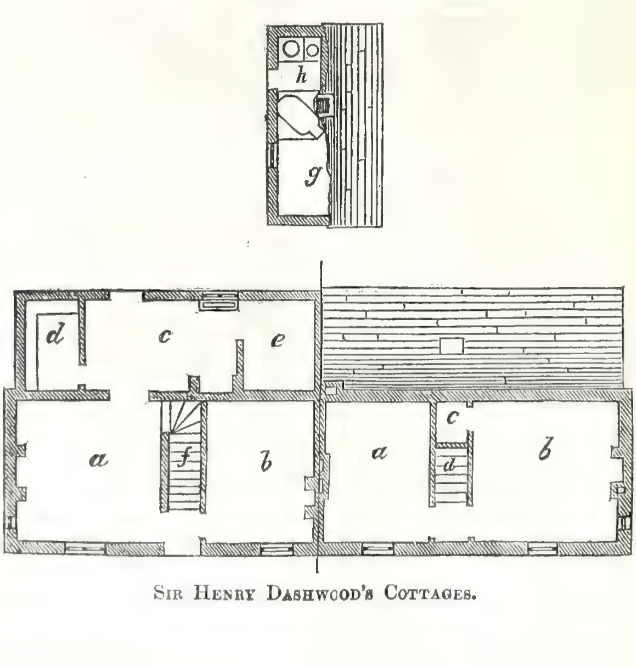


Chamber Floor.

a Bedroom.
b Bedroom.

Ground Floor and Outbuildings.

a Living room.
b Bedroom.
c Scullery.
d Pantry.
e Closet.
f Stairs.
g Bakehouse.
h Privy.



Chamber Floor.

a Bedroom.
b Bedroom.
c Closet.
d Stairs.

Sir Henry Dashwood's Cottages.

encouraging the improvement of existing cottages. It would be difficult to specify them, but in most cases the object has been to advance money to the poorer owners of cottages for the purpose of inducing them to build bedrooms to existing tenements; and one society went so far as to offer a bonus or gift of £5 to such owner as would add an additional bed-room.

Without entering upon any details as to the cost of alterations and additions which may be made to existing cottages to render them conformable to present views, it is manifest that very much may be done with them at a less expense than by the erection of new cottages, an advantage which will enable landowners to adjust the rent in some measure to the circumstances of the labourers on their estates. In fact, it is to this point we must look for a means of reconciling the difficulties of the whole question. The rules laid down by the Inclosure Commissioners for the advance of money to landowners for cottage building in no way extend to the conversion of or addition to existing cottages; and the facilities for getting money for the purpose of erecting new cottages are therefore one reason why so little attention is paid to the improvement of existing structures. This is to be regretted.

3rd. These remarks bring us to the third part of the subject—the advantages of good cottages to the labourer, the tenant farmer, and the landowner, who, being mutually benefited, must severally contribute to the return due to the provision of good cottages.

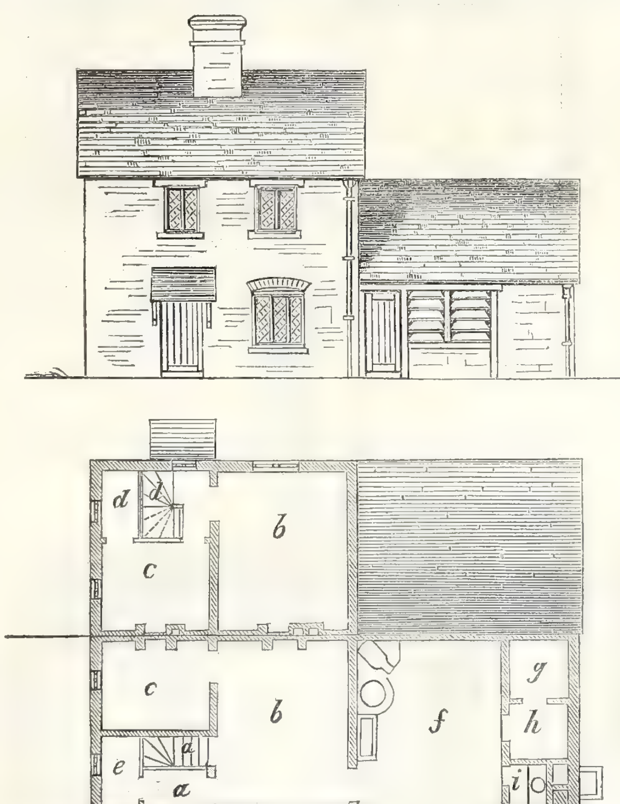
When Lord Palmerston said, "The cottages for the labourer ought to be looked upon as a part of the appurtenances of a farm, just as much as the buildings for cattle, or any other erection essential to the cultivation of the land;" and that "When he built a cottage for a labourer he regarded it as he did the farm-house, for which he did not expect the tenant to pay rent separately from the land," his lordship correctly expressed the connection of the labourer with the land upon which he is employed; and, although there are many who object to the dependent condition to which a labourer is reduced by occupying a dwelling from which he may be ejected by his employer, it is a position, nevertheless, from which it is not possible to rescue him as long as he is unable, out of his wages, to pay the full rent due for his home.

The limits of the present paper forbid our dwelling upon the wide topic of labourers' wages, which it will no doubt be said should be sufficiently high to enable every man to pay his own rent as a free agent, and that the dependence of the labourer upon his employer for his home is a species of serfdom from which he should be relieved. For the present, we can only deal with the question of wages as we know them to be. In the northern counties, the average weekly wages of able-bodied men employed on farms will be found to be 13s. 6d.; in the midland counties they will be 11s., and in the southern counties not quite 10s.

The women (excluding the indoor servants and dairy-women) living in cottages with their husbands or families, have it in their power to gain some money, in addition to the wages of the husband, and these contributions vary with districts. In some the women assist in field-labour more than in others. In Bedfordshire and adjoining counties, straw-plaiting helps to maintain the rural population; while in other localities lace-making answers the same end.

The wages gained by boys of different ages are about the same all over England, varying from 4d. to 1s. per day.

Although there is a wide difference in the earnings of the labourers in different counties, in no instance is it possible for any labourer with a large family, by which the wife is disqualified from earning anything, to pay 3s. 6d.



Chamber Floor.

- Stairs.
- *b* Bedroom.
- *c* Bedroom.
- *d* Closet.

Ground Floor.

- *a* Porch.
- *b* Living room.
- *c* Bed-room.
- *d* Stairs.
- *e* Pantry.
- *f* Scullery.
- *g* Coals.
- *h* Wood.
- *i* Privy and ashpit.

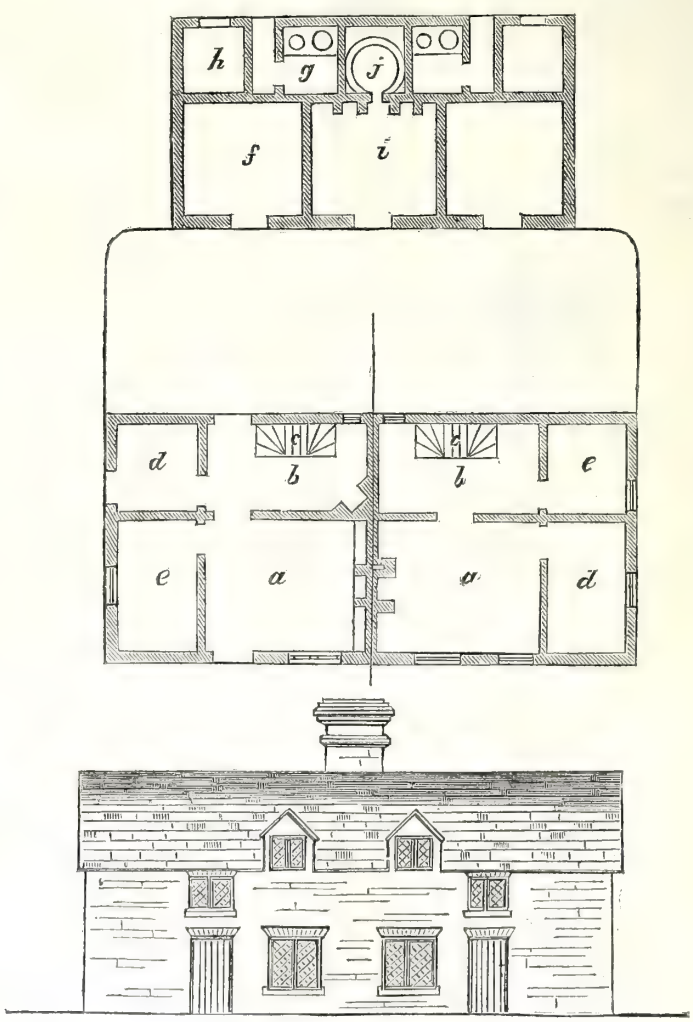
Mr. Denton's Cottages.

a week out of his wages. The advantages to the labourer by the acquisition of a good cottage are, nevertheless, considerable. He will have greater comfort and improved health; but although these benefits will render him physically better able to do his work, they do not enable him, in nine cases out of ten, to earn more wages, and thereby to pay more rent. If his cottage is placed on or near the field of his labour, he will gain more time in which to work in his garden and enjoy his home, and to this extent he is pecuniarily benefited. But, with this advantage, the utmost a labourer can pay in the way of rent is from one-sixth to one-seventh of his earnings; and assuming his wages to be, as in Hants or Dorset, ten shillings per week, with double wages at harvest, it follows that 1s. 6d. per week represents the amount he can set aside for rent. In the Midland Counties, by the same rule, the proportion due to rent will be 1s. 9d., and in the Northern Counties 2s. per week. There is an advantage however to the labourer in a comfortable cottage which he may not directly acknowledge or appreciate, and therefore for which he would be disinclined to pay. One of the certain effects of a comfortable home, with the cleanliness and tidiness which it begets in his wife and children, is to keep him from the public-house, and thereby to avoid the expenditure of his earnings in beer.

I believe no one interested in the welfare of the labouring poor will grudge the cottager the advantage of this saving, but, on the contrary, will rejoice in his thus helping him to a means of educating his children.

The advantages of well-built and well-placed cottages to the tenant-farmer, in securing labour at the time and at the place where it is wanted, can hardly be overrated. Well-placed cottages will not only secure the farmer a choice of his labourers, but will secure him that protection for his stock and property which the presence of selected men on the spot will be sure to gain. He will moreover save the time and strength of his labourers by securing that portion of both which would otherwise be expended in walking to and from the farm. It has frequently been said that the farmer loses nothing in this respect, but that as his labourers are bound to be on the scene of their employment at a given time, and to leave it at another, the loss of both time and strength is theirs and not their employer's. Those persons, however, who look carefully into these assumptions are of a very different opinion.

The advantages to the employer of well-placed, comfortable cottages for his labourers will certainly justify



GROUND FLOOR AND OUT-BUILDINGS.

a Living room.
b Scullery.
c Stairs.
d Pantry.
e Bedroom.
f Wood shed.
g Privy.
h Pigsty,
i Bake house.
j Oven.

CHAMBER FLOOR.

a 1st Bedroom.
b Landing.
c Stairs.
d 2nd Bedroom.
e 3rd Bedroom.

MR. BENYON'S COTTAGES.

him in paying a proportion of the rent. The aggregate value of the advantages has been estimated at different amounts, from 1s. to 2s. a week. If the mean be taken, then, the tenant farmer may be regarded as paying 1s. 6d. per week more in wages for selected men placed where they are wanted.

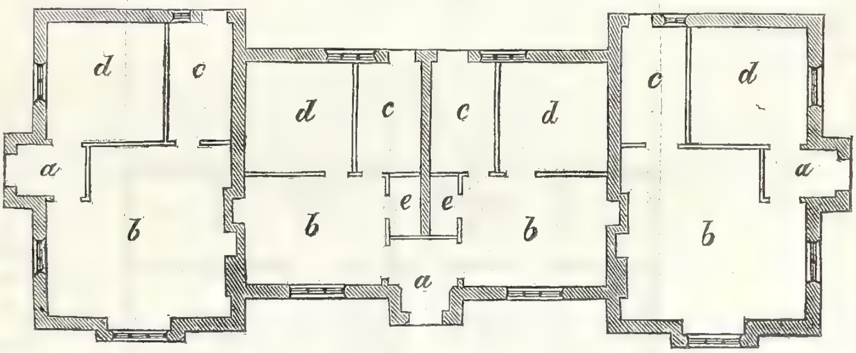
The advantage to a landowner of a good cottage tenantry is quite equal to, though not so manifestly direct in its results as, that to the labourer and the tenant-farmer. Leaving out of consideration all regard for the duties of a landowner in his social position, it will be admitted that the permanent improvement of his property will result more from the good character of the labouring population which is fixed, than from his farm tenantry, which, comparatively, is frequently changing.

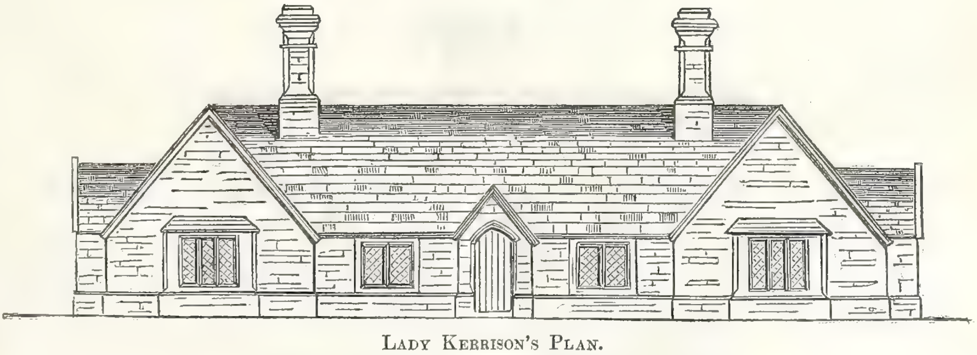
The best cultivated districts, and those which owe their high rents to the superior treatment of the land, have arrived at their present condition from the superior character of the local labourers. The good habits which comfortable and cleanly homes beget, not only secure the superior cultivation and the improved rental which results from it, but they engender a respect for property generally, and are opposed to the evils of poaching and petty depredations which characterise certain demoralized districts. On these grounds the landowner can afford to debit himself with a part of the return due for good cottages. It is very much to his interest to recognise the fact in this light, for it will be a sorry day for him when cottages can be erected at such a price as will enable the labourer alone to satisfy the builder, and induce speculators to run up cottages wherever and whenever it may suit their purposes.

There is one way in which the landowner may contribute to the rent of a cottage in a tangible manner without a contribution of money, which might be more generally adopted. It is by adding a rod of land to each cottage occupied by an able-bodied labourer, and charging him only an agricultural rent for it. The value of land of moderate fertility to a labourer for gardening is 9d. a pole, or £6 an acre, if it immediately adjoins his cottage. The value of the same land for farming may be taken at £2 an acre or 3d. a pole; if, therefore, the cottager pays but 3d., and he is benefited to the extent of 9d. a pole, the difference of value will be 20s. a-year for the rod which the landlord will thus practically contribute towards the cottager's rent.

Before dismissing from consideration the advantage landowners will gain, a word or two should be said as to their duties with respect to the labouring classes. Most nobly did the late Duke of Bedford, in his communication to the Royal Agricultural Society of England, express what he deemed to be that duty (*Journal of Royal Agricultural Society*, vol. x., p. 186):—" Cottage building is, we all know, a bad investment of money; but this is not the light in which such a subject should be received by landlords, from whom it is surely not too much to expect that, while they are building and improving farm-houses, homesteads, and cattle-sheds, they will also build and improve dwellings for their labourers in sufficient number to meet the improved and improving cultivation of the land. To improve the dwellings of the labouring classes, and to afford them means of greater cleanliness, health, and comfort in their own houses; to extend education, and thus raise the social and moral habits of those most valuable members of the community, are among the first duties, and ought to be among the truest pleasures, of every landlord. While he thus cares for those whom Providence has committed to his charge, he will teach them that reliance on the exertion of the faculties with which we are endowed is the surest way to their own independence and the well-being of their families."

But, however striking and true these words may be, it





LADY KERRISON'S PLAN.

a, porch. *b*, living room. *c* scullery. *d*, bedroom. *e*, closet.

is quite certain that, as long as the laws of settlement and irremovability remain as they are, there is little chance of any general extension of cottage building. This is not said to justify the cruel acts of some land-owners in demolishing old cottages without building new ones, but to affirm that there will always be, so long as these laws remain unaltered, a large proportion of the landed interest who will refrain from building while there is a possibility of the cottages they build being occupied by labourers employed on other properties than their own; in which case they say and feel they will only be preparing their own punishment, inasmuch as a residence of three years prevents removal, and gives a labourer who may become a pauper a claim for relief as long as he lives.

If we appeal to the legislature for means of alleviating the difficulties of the case, there are indeed several points towards which attention may be directed. First, to the alteration of the Law of Settlement, or irremoveability just referred to, with a view to encourage the building of new cottages. Second, to the amelioration of the Poor Law, which discourages provident habits in the labouring poor. And third, to the encouragement of sound benefit societies, whereby the labouring poor may provide for old age as well as for sickness.

In speaking of the Law of Settlement, the *Saturday Review*, of February 20, says:—"Like many other parts of our legislation, different portions of it have been enacted at different times, and in different spirits; but the course that has been taken of constantly cobbling up the old law, instead of trying once for all to set the matter on a rational basis, has caused even our most modern legislation on the subject to be infected to a considerable extent with the vices which pervade the early acts of parliament to which the later ones had to be adjusted. The general view that runs through the whole is that every poor man is a burden, that he is attached to some parish or other, and that the paramount interest to be considered in disposing of him is not the interest of the community, nor the interest of the man, but the interest of the ratepayers. Let him be kept, not where he would be most useful or most happy, but where he belongs. The theory that every man belongs to some particular place, and that everywhere else he is an alien on sufferance, pervades the whole Law of Settlement. The sentiment is intelligible enough in reference to the state of society in which it grew up. We can understand how it existed in times when the gentry were a kind of aristocracy, and when the country was full of extensive wastes and woods in which squatters and vagrants might harbour—when there were few manufactures, and when the presumption was that, where a man was born, there he would grow up, labour, and die; but in our own times it is as much out of place as any other vestige of a bygone state of things. A short summary of the law will show how absurd it is:—

"1. Every poor person belongs to some parish, and ought by rights to reside there, and be compelled to return there if he leave it. Still, so long as he is not actually chargeable, he may live wherever he likes; nor is he to be removed at all from any parish if he has resided for three years, without a break, in the union in which it is situated.

"2. If he rents a tenement of £10 a year for a whole year, and pays rates, &c., in respect of it, or if he has an estate of his own and lives within ten miles of it, or if he was bound apprentice in a parish and resided under the binding, he belongs to the parish in which he has done any of these things.

"3. If he has done neither, then he is to be removed to the last parish in which his father performed either of these conditions, or was hired and served for a year as a bachelor before the pauper attained twenty-one; and if the father never performed any such condition, resort must be had to the grandfather, and so on.

"4. If it cannot be shown that any one of these conditions was fulfilled, then he must be removed to the parish he was born; but the parish where his father or other ancestor was born, if ascertainable, has a prior liability, and the remoter the ancestor the stronger the claim, if no settlement has been gained in the interval.

"We have described the origin of these derivative settlements. Their practical cruelty is as atrocious as their absurdity."

No words can more forcibly express the evil of the present state of the law than these, nor more ably present the necessity of legislation. Our agricultural population is decreasing in a most remarkable degree, owing in some measure no doubt to the influence of the higher wages given for labour in other paths of industry, but also to the deficiency and inferior character of our rural dwellings.

The population of 1851 and that of 1861 is given below, in three districts of three counties in the south, in the centre, and in the north of England, and by comparing the returns of the two censuses, the falling off will be seen. At present the scarcity of labour is not felt, but it cannot be a wholesome state of things that the number of agricultural labourer should decrease, while all other branches of the nation's industry are on the increase.

COUNTY.	DISTRICT.	POPULATION. 1851.	1861.
SOUTH.			
Sussex	Uckfield	17,631	17,260
Dorsetshire	Wimborne	17,284	17,253
Devonshire	South Molton	20,566	19,209
MIDLAND.			
Huntingdonshire	St. Ives	20,594	19,654
Lincolnshire	Holbeach	19,134	18,402
Nottinghamshire	Newark	30,344	30,186
NORTH.			
Yorkshire, N. Riding.	Thirsk	12,760	12,299
Northumberland	Alnwick	21,122	21,053
Cumberland	Bootle	6,008	5,880

Upon the subject of the Poor-law only a few words can be said. The discouragement it gives to the achievement of independence among the poor has an evil influence upon their moral character. No labourer will save, nor will he contribute to the safest benefit society, to provide for old age, as long as he knows that he will be punished for his care, by losing all assistance from the parish upon which he has a claim. He is not recognised as a ratepayer, and the collector passes him by; consequently, he takes no interest in parish burdens, although it is more than possible that if the law were modified, so as to admit his claim for home relief when old and past work, in a different and less offensive shape than that in which it is now administered, he would gladly contribute to the poor-rates when young and able.

The last object to which legislation may be directed is that of local benefit societies. So much has been said recently on the advantages of good and the evils of bad management, that nothing need be added on that head. All that is desired is such facilities for the provision of old age among the labouring classes, as will encourage the saving of money, and enable the aged man and wife to retain their cottage and live together, without the fear of separation within the dreaded walls of the union workhouse.

The principles upon which benefit societies are founded might be most usefully extended to cottage gardens, by requiring the able-bodied men to pay such a rent for their garden-land, during their younger days, in excess of the simple renting-value of the land, as will secure the occupation for little or nothing when they are aged and infirm.

Those who have particularly observed the agricultural labourer are cognizant of the fact that a proper allotment of land with the cottage is highly beneficial to the young and old alike, but the benefit is lost if the quantity is increased beyond that which can be properly treated by the

able-bodied labourer after the labours of the day are over, or if the physical powers of the labourer have become so impaired by age as to disqualify him for the use of the spade and thereby to do justice to the land.

Speaking my own conviction, I may say that although abstractedly it is right that in proportion to the acreage of cultivated land in each parish so should be the number of dwellings for labourers within it, I have more faith in the influence of mutual interests than in any amount of legislation. I hope I have shown that the interests of landowners, tenant-farmers, and farm-labourers are all unitedly promoted in the improvement of agricultural cottages; and a general acknowledgment of this fact, with an admission that each should contribute in one shape or another to the return due to the capital employed in the outlay, will accomplish all we want, for it will leave the labourer with only that proportion to pay which is consistent with the amount of his weekly wages.

DISCUSSION.

The Hon. and Rev. S. BEST said the whole cottage question was surrounded with difficulties, and he did not think they must for one moment allow themselves to run away with the idea that the blame of the present grievous state of the country rested upon the shoulders of any particular class. The duties of landowners had been particularly referred to, but he asked them to consider what was the position of many of the landowners. Some held only for their own lives, and some only for the lives of others, and there were others whose interests were limited in various ways. How, then, was it possible that any general scheme should be adopted which should render the landowners, under such varying circumstances, responsible for the state of the cottages of this country? He had come to the conclusion, after considerable experience, that they would never solve this question till they could get a marketable return for the capital invested in cottages. They asked persons to build cottages, which, he believed as a general rule, would cost £125 each under the most favourable circumstances, but the return for such cottages was, as a general rule, in his own district, about a shilling per week. Besides this there were repairs which, in the case of cottages, were larger in proportion to their value than in houses of a higher class. Under these circumstances it was clear that cottage-building would not be undertaken commercially. When the land-owner was asked to put up cottages for his labourers, he was, in fact, asked to pay a portion of their wages. Was this a fair demand? The proper condition appeared to him to be that the tenant who had the advantage of the work done by the labourer, should pay him fair and adequate wages for it. It was said to be difficult indeed to raise the labourer's wages, but that was a point it was impossible to discuss on this occasion; he must, however, say incidentally there was no great effort made to pay the labourer according to his work. Anybody who had had much to do with the details of a country parish, knew that there was a sort of head-money system; whether a man was a skilful and industrious labourer, or not, the same amount was paid for his labour. He hoped, as they paid their servants and others in proportion to their skill, so they would treat the agricultural labourer. Whenever they should have arrived at that point, he thought they would have taken one important step towards securing for the labourer such accommodation in the shape of cottages as he required. He hoped the day was not far distant when they should so educate the labouring classes of this country, that they would not be satisfied with the degraded hovels into which they were now put; and the demand, coming from the lower classes themselves, would compel those above them to provide the requisite accommodation. He did earnestly hope that these causes combined would lead to the accomplishment of that which he was sure they all so sincerely desired.

Sir THOMAS PHILLIPS rose with some reluctance to address the meeting, because he thought many of his friends around him were better acquainted with the subject than he was, and he had hoped they would have given their own experience and suggestions upon the paper which had been read to them by Mr. Denton. But regarding this topic as one of primary importance, applying (if all the labouring classes were included) to the dwellings probably of 15 millions of people, and to something like 3 millions of habitations, he agreed with Mr. Best in thinking the question was really an economical one. Possibly legislation might do something. He was not sure it would do as much as Mr. Denton imagined, but it was no doubt the duty of the legislature to facilitate, by all proper means, the providing of suitable dwellings for the community. The question was a national one, and should receive the aid of every private person as well as of the state, to bring about the desired result. Legislation ought no doubt to be directed to the facilitating of the acquisition of sites for houses in those places where, without legislation, they could not be obtained. Whether in certain special circumstances the legislature might even extend compulsory powers to the acquisition of land for houses he was not prepared to say. In some shape or other it was obvious, where cottages were required, there should be some power of obtaining the land necessary for their erection. To that extent it was possible legislation might do something. Then with regard to the operation of the poor law, the law of settlement, and the law of relief, it was true those laws had no doubt operated in inducing landed proprietors to take down cottages, or to obstruct the erection of cottages. But they must take the law of settlement with its advantages and disadvantages. No doubt anything which prevented the full circulation of labour was an evil in itself, but on the other hand anything that tended to remove the independence of the labourer was also an evil; and he apprehended at least they would find it was absolutely essential to have local supervision in the administration of relief, and he did not see how that could be given without some definition of chargeability and some definition of removability which would operate in restricting the circulation of labour. He believed, however, that they must after all direct their attention to the economical view of the question. As long as the labourer was not able by the wages he earned to pay the rent of a good cottage, he feared he must live in an inferior one. Therefore it was entirely a question of wages, namely, what the labourer could afford to pay for his cottage. They had been told this evening, and he believed truly told, as far as his own personal experience went, that the cost of cottages approached £300 per pair, though under special circumstances it might be less, and that cost represented a rent of 3s. per week. The agricultural labourer, they knew, under favourable circumstances, did not earn more than 12s. per week, and 10s. might be regarded as the average in the southern parts of England, and out of 10s. a labourer could not appropriate 3s. for rent. It seemed to him, therefore, the great problem was how to increase the labourer's wages; how to improve his position. And this problem involved important moral considerations. They had undertaken the better teaching of the labouring man, and imbuing him with healthier and more elevating sentiments; and in proportion as he was educated and humanized so would he be induced to feel that he ought to be properly and decently lodged, and his family placed under better moral and sanitary influences, and by that means they would induce the demand for a better cottage, and so ultimately lead to the supply. He regarded the advantages as being very largely of a moral kind. Those conversant with rural districts knew that nothing so much conduced to the demoralisation of the labourer's family as their being improperly lodged. Therefore it was, he believed, one of the problems that ought to occupy, and indeed did occupy, a large share of the attention of all thinking men, namely, how they could benefit

the rural labourer in this respect. He thought the suggestions of Mr. Denton, as to the improvement of existing cottages, were of great value. He believed the cost of erecting new cottages did disincline men to undertake the work, and if the improvement, and enlargement occasionally, of existing cottages were undertaken, a great deal might be done to accomplish the ends they had in view. The direction of public opinion on this matter was indicated by the drawings they now saw on the walls of this room, which had resulted from the liberal offer, by Mr. Denton, of prizes for the best design for labourers' cottages. He (Sir Thomas Phillips) regarded this as amongst the many proofs that they were alive to the great importance of this question, and he could not help thinking that, being alive to it, they would, with the practical qualities which generally distinguished his countrymen, put their shoulders to the wheel and take adequate means to remedy these serious evils.

Mr. Henry Smith (Government Drainage Inspector) hoped they were not to wait for the improvement of cottages either till the labourer of Dorsetshire and Wiltshire was able to pay 3s. or 3s. 6d. a-week rent, or till the labourer himself became so educated that he would demand cottage accommodation; but he hoped public opinion and public feeling would be brought to bear upon the owners of property to induce them to erect better cottages, and to improve the condition of the labourers upon their estates. They were much indebted to gentlemen like Mr. Denton for offering premiums for designs of cottages; they were also indebted to anyone who agitated the subject of the improvement of these habitations. He did not quite agree with Sir Thomas Phillips, that it was a question solely of per-centage upon the outlay on the cottages. They found practically in those districts where the highest scale of wages was paid—in Durham, for instance, where the ordinary pay of the agricultural labourer was 3s. a day—there were still as bad cottages as in Wiltshire and Dorsetshire; therefore it was not solely a question of wages. He contended it was to the interest of the landowner to build good cottages; and though the labourer was not able to pay him 5 or 6 per cent. upon his outlay, still the tenant farmer was able to pay a portion of that, the landlord was able, by the improvement of his estate, to pay a portion, and the labourer himself was able to pay the other portion. He knew, as a practical farmer, there was great advantage in having the labourers residing upon the spot. He knew this by his own experience. He considered he derived considerable benefit from having cottages on his own farm. He assumed that he got equal to a shilling a week rent in the advantage of having the labourer near to his work: the landlord obtained a larger rent for his farm because it was well stocked with cottages wherein the labourer could reside. It was only on the principle of this division of benefit that they would be able to improve the labourer's cottage; and he was of opinion if landlords erected cottages on their estates, and divided the interest of their outlay fairly between themselves, their tenants, and the labourers, the great object would be accomplished.

Mr. C. F. Hayward remarked that so much had already been said, in the course of this discussion, that little was left for him to add, except in confirmation of much that had been advanced. He considered the remarks of Mr. Best, with respect to the wages of the agricultural labourer, had hit upon the sore point in the condition of that class. It was quite certain they were generally under-paid, and their wages were supposed to be partly made up by the amount they paid for their cottages, their gardens, and the other little advantages they were supposed to receive. He had no doubt that ultimately this state of things would be remedied, and that when the subject was sufficiently ventilated it would be seen it was to the advantage of all concerned that the wages of the labourer should be paid to him in money, and that he should return a certain portion of those wages in the shape of rent. Time was when in the agricultural districts the tenant had to provide certain conveniences and perform certain services for the landowner, the evil of which had been shown in a recent action at law between a noble proprietor and his tenant, and that system, as well as estimating the rent of the labourer's cottage as part of his wages, would rectify itself. The practical point to be considered was how, under certain circumstances, labourers' cottages could be improved, and they were much indebted to Mr. Denton for bringing this subject under their notice. As one of the judges of the designs submitted for competition, in reference to Mr. Denton's offer of a premium, he (Mr. Hayward) thought it was satisfactory to find that their views were so much confirmed by Mr. Denton himself on the subject of the cost of these cottages. It was no use blinking the question of the cost, because it was now fairly before them. It had been asserted over and over again that good cottages could be built for £100 each, but having investigated the subject a good deal, he had come to the conclusion that it was only under peculiar circumstances that what were called cheap cottages were built. He had inquired into various cases of this kind, and in some instances it turned out that the bricks were made at odd times on the estate by the workmen connected with it, and cost on the spot only 17s. per 1,000; the timber used was grown on the estate, cut down, and sawn by the labourers on the estate; the building was superintended by the bailiff amongst other duties included in his ordinary salary, so that there were no builder's profits, or anything of that kind. In the examination of the designs, now hung on the walls, it had been necessary to inquire into the particulars of the estimated cost to see if they had been calculated fairly to meet the ordinary circumstances of building. There was one practical point of great importance which Mr. Denton had referred to, viz., the convenience of having one bed-room on the ground-floor. He (Mr. Hayward) thought that decidedly important, because in many cases it was desirable, inasmuch as the upper and lower floors could thus be better arranged with regard to each other as to space. When three bed-rooms were provided on the upper floor they required the ground-floor to cover a larger area than was absolutely necessary. It was a mistake to give too much area to the ground-floor. If they made the scullery too large it was found, as Mr. Denton had observed, that what was intended as the living room was converted into a parlour to be used only on Sundays or holidays. He had known cases in which the useful appurtenance of a corner cupboard had been objected to because it interfered with putting a sofa into the room. While on the one hand they might err in endeavouring to provide too great luxuries for labourers' cottages, yet on the other hand they must recollect that in the modern dwellings of the middle and upper classes of society the conveniences had been very much increased; and in a certain degree he thought these improvements might fairly be extended to the labourer's cottage. The now common plan of laying boarded floors was a luxury as compared with the tiled or brick floor of former days, and the plastered interior walls were a decided improvement upon the rude "cob" walls which were still frequently met with in the rural homes of the country. The designs now upon the walls ought not to be regarded as conclusive upon this subject, but rather as a fresh starting-point, and they must go on discussing the matter till it was brought home to people's minds in every part of England. Many noblemen, and large landed proprietors, had already shown their interest in the subject. Foremost among those were Lord Palmerston and the Dukes of Bedford and Northumberland. It was stated by Mr. Roberts that the two latter noblemen had spent nearly £200,000 in cottage building on their estates, and from what he knew of those on the Tavistock estate of the Duke of Bedford, they were remarkable for comfort

and convenience; at the same time they were erected in large and long blocks, and built under the superintendence of a gentleman connected with the Duke's estates, and he believed the average cost of those cottages was only £120 each, for, when building was executed on a large scale, on an estate where the usual builder's profits did not occur, of course the cost would be less than when simply a pair of cottages was to be erected.

Mr. WEBBER said the tendency of the discussion this evening was to leave on his mind the impression that there were many things desirable which were not practicable. They were told that the building of a cottage to ensure the comforts they desired for the agricultural labouring class would cost £150, but that their wages would not allow them to pay a rent adequate to that outlay. It appeared to him, in the consideration of this question, they had left out of sight the important material of timber. In various parts of America he had seen many timber houses, and he should be glad to hear from Mr. Denton what would be the cost of this material as compared with brick. He should imagine it would be much less. He quite agreed with the opinion that if they had to wait for suitable cottages for the labourers till their wages enabled them to pay the rent, the object they sought would not be realised in the present generation.

The CHAIRMAN, in closing the discussion, said he thought this question must be considered as one of wages and of capital; but then the question arose—Of what did wages consist, and of what did capital consist? Wages, especially in agricultural districts, must not be taken simply as money received for labour, but they must be looked at, whether paid in money weekly or by other arrangements, as a means of obtaining the greatest amount of labour from a given expenditure. With regard to the question of agricultural cottages, expenditure incurred to improve them must be considered as a substitute for money wages to the labourer, and as the best means of improving his condition, for the better he was lodged the fewer days of sickness he would have in the course of the year, the higher state he would be in during the whole period he was at work, the greater amount of labour would he give to his master, the greater protection he would afford to the estate; and altogether the man who was kept in the best social and physical condition would undoubtedly be the best servant to the master who employed him. Therefore when they considered the cost of an agricultural cottage, and said that it could not be built unless the landlord received a money return as interest upon the amount invested in that cottage, he thought they took a short measure of the real benefit he received from such an investment of his money. This was a question so large and complicated that it was impossible, in an evening of this kind, to sift and investigate it thoroughly, and bring into view the importance of this great subject—for undoubtedly it was a national question of the highest moment, affecting the interests of several millions of the population. The Society had appointed two days (the 26th and 27th) in the present month for a conference, to which all persons taking an interest in the subject were invited, in order to give the public the benefit of their opinion, and of the information they possessed, with the view of suggesting, if possible, some remedy for the evils which were acknowledged to exist; but whether they could be remedied by legislation was a difficult question to determine. Undoubtedly they legislated for lodging and feeding prisoners; they legislated for those who were unable to work for themselves; they legislated for soldiers; they provided, at an enormous expense, all the materials for war; but they had not attempted to legislate for the encouragement and protection of those latent elements of good which existed in the working classes of the country. Was it to be said that it was impossible to bring into play, by legislative means, the latent principle of good which existed among the agricultural labourers of this country, but which was now smothered, and frequently destroyed, by the want of comfort and decent accommodation in the homes of working men? Were they to remain under the obloquy of spending millions annually in providing for the punishment and cure of vice and the materials for carrying destruction wherever they were used, whilst they refused assistance to those who were struggling to do their best to prevent them becoming a burden to society? Therefore, though it was at present difficult to say in what form legislation should proceed—and he hoped some views on that question would be elicited at the approaching conference—he trusted some remedy might be found for the evils now produced by the inadequate house-room for the labouring classes. There were great principles, however, on which this question rested, which must not be forgotten. They must not forget that wages could not be touched by legislation, and this led him to one portion of the paper which referred to the decrease of the agricultural population, and the corresponding increase in the manufacturing districts. Instead of lamenting this migration, he said, let it continue still more, for by that means only would they drive the landlord to pay higher wages to secure the labour they wanted. So long as commerce paid a higher price for labour than agriculture, so long let commerce take from agriculture the labour it required, and let agriculture tempt back that labour or prevent its leaving by paying for it at the same rate as commerce did. They would then find the effect of legitimate competition to secure the best services of the best men, and in the agricultural districts part of that payment for labour would no doubt be provided by finding good cottages and gardens for the men. He now had to say a word respecting the capital applied to cottage building. They were told a rental of 3s. per week was necessary to pay a certain per-centage upon the cost, but nobody asked how much per cent. was necessary to induce builders to erect gentlemen's houses, although, no doubt, ample interest was paid for it. Why should not capital derive an equal rate from cottages? It was not the want of demand for them that prevented it, and he would not believe that it was inseparable from the condition of a cottager that he should be unable to pay adequate interest on the capital which had been employed in building his house. But the real question for consideration was what could now be done to secure better house accommodation for this class? Their attention had been this evening almost confined to single cottages, or at the most, to pairs; but ought they not to look to a series of houses rather than to isolated cottages? If they wished to produce the cheapest and best buildings, was the double cottage the best form of construction? Then there were many other very important points for consideration, bearing on this question, as to whether relief from fiscal burdens could not be afforded to certain classes of buildings. But this was too wide a question for this evening, and he would only say that he thought there were many forms which legislation might take, which would give greater facilities to the working man for obtaining and keeping a cottage of his own, and it was by those facilities they would increase and improve the accommodation they were contending for, for if a man possessed a cottage of his own he would not be content with such as they now lived in. He would conclude by asking the meeting to thank Mr. Denton for the ability and talent he had shown in bringing this interesting subject before them.

The vote of thanks having been passed,

Mr. BAILEY DENTON, in acknowledging the compliment paid him, said he entirely agreed with the remark of Mr. Henry Smith, that if they had to wait for improved cottages until the wages of the labourer were raised they would probably be likely to wait till the end of this century. The Chairman had expressed what he (Mr. Denton) meant when he said the money paid to the labourers was not the only element of wages. If the

tenant-farmer contributed to the labourer's comfort by finding him a house, and the landlord by providing him with a garden; those were two elements which required to be taken into consideration. He knew the popular idea was that wages meant simply money paid. Now, until they understood this subject differently, he thought they would remain without any proper provision of cottages. In fact, it was the desire to get that part of the subject understood that led him to bring this matter forward. With regard to timber-built cottages, he was not prepared to answer the question as to the cost, when compared with brick, inasmuch as proprietors did not recognise timber as being sufficiently substantial for building purposes.

Proceedings of Institutions.

Liverpool Institute.—The lecture-hall of this Institute, which is an amphitheatre, with a gallery, and contains accommodation for about 1,200 persons, has recently been decorated according to designs supplied by Mr. H. B. Roberts, of the Liverpool Academy of Art, to whom the ornamentation of the Philharmonic-hall was entrusted on the last occasion. Mr. Roberts has produced a beautiful result in design and colour, and the painting and marbling have been creditably executed by Mr. Davis, of Rathbone-street, the contractor for the work. The ceiling is painted fawn colour, with border of double Greek key ornament in brown, and corners inlaid with red honeysuckle. The centre is white and gold, with red mouldings and band of blue and white, ornamented with purple honeysuckle. The chandelier is stone colour and gold. The skylights have been re-glazed with plate glass. The counter lights are painted Etruscan brown, the styles grey, with purple ornaments and gold mouldings. The large cove is painted pink, resting on a cornice of white and purple scroll work, harmonising with the walls, which are green. The doors of the gallery are purple, green, and gold. The pilasters in the niches are painted Sienna marble, and on each is placed a bust of some one eminent in science, art, or literature. The organ is a special object of attraction; the columns are painted in imitation of jasper marble, with white parian caps and gold mouldings, and resting on a base of porphyry, with panels of Egyptian green marble; the pipes are blue and gold: the cornice and arch white, gold, and pink, with frieze of blue and white ornament. In the gallery front the balusters are buff and gold; the pilasters buff and black, with grey and red styles; the frieze is stone colour inlaid with pink panels, and purple ornament, in gold mouldings. The light iron columns which support the gallery are encircled with strap-work ornament, and have caps of white and gold. Hitherto this hall has been used only for lectures and meetings in connection with the Institute; but in future it will be available for public meetings, lectures, and concerts, the directors having determined to let it for these purposes.

Richmond Young Men's Society.—On the 26th of April a meeting was held in the Lecture Hall to present Mr. W. Robinson with a token of their esteem for his energetic services as secretary, and to award the prizes granted during the session to successful essayists. The testimonial consisted of an electro-plated tea service and an ornamental timepiece, with the design, "Palissy surveying the success of his enamel." The prizes consisted of books chosen by the young men themselves. The Rev. L. H. Byrnes, of Kingston, took the chair, and in opening the proceedings said that these societies were needed at the time when lads left school, and went into the world, where new and powerful influences would be operating, and the youth would find it difficult to maintain principles imbibed in early days. G. F. Whiteley, Esq., was called upon to present Mr. W. Benning with the prize for his Historical Sketch of Tunbridge Wells. Dr. Wilkie was requested to present the prize awarded for the best essay on "Character" to Mr. H. Cullum. Rev. G. S. Ingram spoke at some length on the composition of essays, urging the advantages arising from the exercise of thought. A mind capable of extensive observation was desirable in all that would wish for a place in the world. He who would write to interest must necessarily take a wide range of thought, contemplate the subject in its different bearings, and draw careful conclusions. Style was an essential part of literary composition, and should receive more attention than was usually bestowed upon it. Rev. J. Banham said that work was a duty proclaimed by Divine law, and scarcely less so by the sentiment of civilized man. He that would not work was refused any claim upon the privileges of society. As indolence might be termed the parent of vice, so industry might be regarded as the progenitor of happiness. W. J. Maxwell, Esq., presented to Mr. W. Robinson the testimonial for which the meeting had been principally convened. He spoke on the utility of such societies, and referred to the debt due to the energy of their promoters, especially referring to Mr. Robinson as an example of industrious integrity and energy. He considered the testimonial as very appropriate. Mr. Robinson replied that he was grateful to the society for the way in which they had recognised his past labours. He had found great pleasure in discharging the duties of the society. He had seen it in sunshine and in clouds, and his solicitude for its success was as strong as ever. He felt deeply indebted to other members of the committee, without whose aid his services would have been comparatively valueless.

Fine Arts.

A PROPOSAL FOR AN ART RESULT SOCIETY.

By C. Bruce Allen, Esq., Architect.

The Art Result Society would be founded on the fact that none of the Fine Art Educational Societies now existing seem competent to raise art, as applied to common objects in daily use, from their now artistically inexpressive state, as they are now executed by common workmen.

Whatever may have been the means employed in past times for the production of works in common and daily use artistically expressed, and whatever, whether great or small, the means of art education of those times, it is quite certain, from the remains those times have left us, that the whole artistic power and means of expression of the artists and workmen of those times, ultimately found their way directly to the object itself, whether great or small, whether a building or a jewel, and did not confine itself as that artistic power now does to paper and representations.

This past mode of work it was that now enables us moderns to fill vast museums and exhibitions with such costly and beautiful work—with such evidences of the artistic capacity and high art feeling of the men of past days. It is the mode of work which has made the difference between a cathedral of the thirteenth century—as an expressional artistic result—and a modern railway station; between a cup or coin by Benvenuto Cellini and a modern race cup, or a penny piece.

It is not, therefore, the men and artists who are less able now than they were, but that the system of art education primarily, and the artist action finally, that would seem to be the causes of this world-wide difference and former excellence, and of the present art-nothingness and almost universal failure. The artistic faculty and power of the present time may be fairly said to be wholly expended, and, it is to be feared, lost, on paper and in representations: the final result, the object itself, whatever it be, whether a building or a coin, in all cases being executed by inferior men, *i.e.*, workmen and not artists.

That the remains of old art—the work of the artists of past times—has indeed this almost infinite superiority over the fine art products of the present time, would seem to be proved beyond any possibility of doubt, by the price so readily given for "antique art," fifty to a hundred and fifty pounds, and sometimes more, being obtained for a very ordinary cup and saucer—the sole difference between them and their modern copies, at a cost of as many pence, being simply that the first were the works of an artist, and actually executed as well as designed by him; and the modern copy is a work of manufacture, and executed by a mere workman in whom the artistic element is wanting.

In buildings, too, this modern inferiority is to be noted, the sole difference between the works of the present and the past lying in the fact of the details of the old work having been the actual hand-work of artists, *i.e.*, of artist workmen; and the building of to-day being the result of a division of labour and the actual hand-work of simple workmen, and not artists or artist workmen. We may compare the decorative work now going on in St. Paul's Cathedral with the art decoration and wall painting left to us in the Westminster Chapter House—the one the result of labour, and the other of artist labour. The artistic element of design may in any two given works be equal, but the final result different, according to the mode of execution. It would be, therefore, in the mode in which the artistic process is applied that this proposed new society, or extension of the art action of one already existing, would endeavour to create and help forward a radical change. It would ask not only design, but execution—not only for artistic design expressive of modern wants and feelings, but for artistic execution embodying and carrying out in material such design.

It would regard designs and drawings on paper as means only, and not as ends, as is now the universal art practice, and would ask for the final result of all art power and action, whether in artists or workmen in material, *i.e.*, the object itself. Not copies of old work by artists and workmen who have long since passed away, but new work, both in design and execution. It would demand modern results.

Another element in this proposed society would be—and it is a most important one—recognition. In all cases the artist and workman would be credited with his work—irrespective of the architect, manufacturer, or seller—whether he be the artist draughtsman and designer on paper, thus indicating the work to the executive workman, a work now always to be done, or whether he be the artist workman, the actual executant. This is the one great essential of future progress in fine art. It may here be observed that absolutely perfect work can only be accomplished by the mind and hand of one man, like a picture. The original thought, the design, the drawing, and the actual execution, must be the result of the successive action of the mind and hands of one person, a single intellectual and manual feat in fine art.

But the spirit of modernism and manufacture having compelled a division of this simple and primitive mode of art work, it necessitates two distinct elements or powers—the draughtsman to indicate the proposed work, and to show to the workman how it is to be done, and the workman himself to execute the work. It is obviously inferior to the first mode, but it is now the only practicable one, and in almost universal use. Every object in which fine art at all enters that is to be seen in our shop windows, the true receptacles of the art of a nation—has been produced by this twofold process, the making of the indicative drawing or design by an artist draughtsman, and the execution of the work itself by the workman. Both these art means it must be the business of the proposed society to recognise and encourage, by demanding both the drawing of the draughtsman and the work of the workman. The last is now, happily, being done in many ways, but, unfortunately, not modern work, but copies of past work; but the first, the drawing by the draughtsman, without which the modern workman cannot act, has never yet been asked for. It is as important as the work itself, for without it, the object itself, the final result, as a work of art, whatever its value, could have no existence—our modern art workmen not being able to draw a design.

But this mode of action, driven, as we must be, to it by the modern system of the division of labour, need not hinder, but would tend rather to encourage, the society, to ask of the draughtsman, on the one hand, for a specimen, if possible, of his executive power in material; and it would, on the other hand, equally ask of the workman a specimen of his powers as a draughtsman, and would, it is to be hoped, so tend to urge him to learn and cultivate his fine art faculties as a draughtsman as well as an executant.

The society would also, for its highest work, ask of our artists art work in material, which, although so novel in modern times as to seem almost impossible in practice, was, in past times, the common practice in the production of works of fine art, indeed, the sole way; and it is therefore hoped that, at least in some cases, our leading artists will be induced to contribute results in material, if only by way of example and encouragement, and to show what is possible. Past ages have left us of the present age not drawings or representations on paper of what they thought and did, but their fine art thoughts wrought out in the enduring materials dug from the earth, made living by the impress of artistic and individual power upon them; while this age will leave nothing whatever as evidence of its artist strength but what is to by found on paper, and the feeble and lifeless reflections of it by the hands of other and inferior men.

It has been said that the great principle of the division of labour is indeed the moving power of civilization, and must, therefore, extend itself to all branches of science, industry, and art; but it would be the vocation of this society to enunciate the great art truth, that while this division of labour and power of machinery are legitimately competent to multiply the coins from a single die, they are not competent to cut the die itself. This is artists' work, and the work of one man, and one only. The chief and practical objects, therefore, of this proposed society or of any others that might spring from it, would simply be to offer prizes annually to artist workmen and also to artist draughtsmen for specimens of their combined skill, *i.e.*, for the working drawing by the draughtsman, which served to guide the workman in his work; and also prizes for the actual work itself, as finally executed by the workman. These two elements in the production of modern fine art, whatever it may be, are so intimately connected together, that the one cannot go on without the other; the workman is at present unable to work without either the direct copying of some detail of old art, or architecture, or the detailed drawing of the future work as prepared for him by the artist draughtsman.

It would also initiate a great social object by bringing into acknowledgment and notice, and, it is to be hoped, encouraging a hitherto unnoticed and unrecognised class of men, and a class from whom society mainly obtains the art in all the objects it sees and uses, viz., the class of artist draughtsmen in our art manufactories. It is these men who serve to fill with art objects the shop windows, and from them our houses, with their furniture, china and glass, fabrics, and decorative work, indeed, everything but pictures.

It must be anticipated that the progress of such a society as this now proposed, or societies, if more than one, must of necessity be very slow, for not only have the workmen and artists to be invited to work in a new and strange way, but the public mind itself is not at all instructed as to the causes of the difference between the now manufactured and the real art.

But, difficult as must be even the first beginnings of such a society, the great idea on which it is based—that of the individuality of the artist—now nowhere recognised except in painting, but which in all the great epochs of art must have always been the sovereign idea, does yet

perpetually, as all great truths will, flash across the minds of thoughtful men.

A most illustrious authority has said—"In comparing the works of past times with those of our own age and country, while we may well be proud of the immense development of knowledge and power of production which we possess, we have reason also for humility in contemplating the refinement of feeling and intensity of thought manifested in the works of the older schools." In this emphatic sentence will be found the keynote to the future of art.

The Fine Arts in Paris.—In Paris, as in London, May is the festival month of painters, sculptors, and all the other devotees of the temple of beauty, the season of hopes and fears, of triumphs and sad disappointments. The annual exhibition of the works of modern artists opened, as usual, on the first day of the month, and, that being Sunday, the public was admitted without charge, and the gallery, large as it is, was densely crowded. A private view, however, took place on the Saturday, and the members of the press and the principal artists had the advantage of a quiet examination of the collection on that and also on the preceding day. As regards paintings, the fact of the exhibition being now annual, instead of biennial, seems to have had very little influence on the number of works sent in; in round numbers nearly three thousand pictures were received, each artist being limited to two works instead of three, the number allowed last year; and of these two thousand were accepted, and form the exhibition proper of that section. Two large departments of the gallery are set apart for the rejected, but, as may be supposed, the greater number of those whom the jury has struck out, have taken care to hide the evidences of their non-success, and the consequence is, that these two rooms exhibit a most deplorable aspect. The exhibition certainly exhibits a vast amount of ability, an immense painting power, but the number of great works is, perhaps, less than upon any former occasion for a considerable number of years. The limitation of each artist to two works has greatly contributed to the mediocre character of the collection, as there are some three or four artists who, having before received medals, or distinctions in other forms, are exempt from examination by the jury; and had each been allowed to send three examples, the proportion of good, or, at any rate, of fair pictures, would have been greatly increased. The limitation of two works is pretty generally condemned as a mistake, and it is believed that it will not be repeated. There is another reason for the poorness of the exhibition, in the absence of a large number of the leading artists from various causes; amongst others, of Cabanel, Flandrin, Couture, Pils, Troyon, Baudry, Jalabert, and Muller. Several of these gentlemen have refused to exhibit from the fact of their being members of the jury; death has snatched away Hippolite Flandrin; and Troyon, the admirable landscape and animal painter, has been visited with sore affliction, and has destroyed with his own hand one or more of his finest productions. The exhibition cannot be said to be strong in any department, but the number of works is vast—nearly four thousand in all—and the mere manual dexterity of the greater portion of the exhibitors so remarkable, that an observant student would spend a week most satisfactorily in studying the exhibition. The whole system of rewards has been changed; for some years it has been the habit to give one grand prize, nominally a medal, but really a sum of four thousand francs, three first-class, six second-class, and twelve third-class medals in the sections of painting and drawing, half those numbers in that of sculpture, and a proportionate number for engraving, lithography, and other works, and, in addition to these, a large number of "rappels," or records of exhibitors deserving any medal which they had previously obtained, and a mass of honourable mentions. These latter honours have been long felt to be worthless, and they and the rappels are now abolished. The rewards established this year consist of two grand medals of honour, one for painting and the other for sculpture, and each of the value of four thousand francs, and of forty medals in painting, fifteen in sculpture, eight in engraving, and four in architecture, all of the same value, namely, four hundred francs, and paid entirely in cash if desired. This medal is only to be bestowed three times on any one artist, the recipients then becoming entitled to the cross of the Legion of Honour. The awards, contrary to former practice, have been announced at the outset of the exhibition, and are recorded on the frames. The jury has also made another innovation, namely that of placing the word "exempt" on the works of those artists who, having previously received medals, are emancipated from the dictum of the admission jury. The grand medal has not been awarded in the section of painting, the jury having found no work deserving of the honour; and that in sculpture has been assigned to an artist who died during the year, and who left only an unfinished statue. Count Nieuwerkerke, the superintendent of fine arts, has performed a very graceful and judicious act in giving free admissions to all the students of the Imperial School of Fine Arts. Some months since a great change was made in the constitution of the school just referred to, the administration of which was taken from the Academy of Fine Arts and placed under a separate commission, consisting of a few members of the academy itself joined with a certain number of eminent artists, outside of the academy, and a few officials connected with the Imperial museum. This gave rise to loud complaints on the part of the academy, and it is said that the members have determined to mark their sense of the proceeding, and to show the public at the same time their own power, by establishing an exclusive exhibition of their own works.—The Emperor has purchased a copy in mosaic, by Professor Maglia, of Raphael's Virgin with the chair; the work is of the same size as the original, and occupied the artist nearly seven years. The price paid was 35,000 francs (£1,400).—The repairs of the great northern door of Notre Dame have just been completed, as far as regards the stone work, and the statues are now placed in their niches over the south door, so that the restoration of this beautiful church may be looked upon as approaching a conclusion.

Eugene Delacroix.—The Société Nationale des Beaux Arts has decided on organising an exhibition of the works of the late Eugene Delacroix, to take place in its rooms on the Boulevard des Italiens. M. Théophile Gautier is the president of the committee entrusted with the work of collection and arrangement, and several eminent artists and men of letters are included in the list of its members.

Fine Arts in Bordeaux.—One of the most remarkable provincial exhibitions in France, namely, that of Bordeaux, is closed, or about to close. It originated with a few amateurs, who, in 1851, formed themselves into a society, called the Friends of the Arts, and its first exhibition took place in the month of November in that year. The original number of shareholders in the undertaking was 672; the municipal authorities of the town voted a sum of 3,000 francs, and the conseil-general 600 francs in aid of the first exhibition, which comprised nearly five hundred works of art. The society laid out 15,000 francs in purchases, and 8,000 more were received from private individuals. A few months after this first exhibition of the works of living artists, another was organized, to which 847 pictures by old masters were contributed by amateurs in Bordeaux alone. In 1853, the exhibition was highly successful; the authorities purchased Cogniet's picture of the "Daughter of Tintoretto" for their museum, for the sum of 20,000 francs; the purchases of the society itself amounted to more than 26,000 francs, and those of private persons raised the total to 63,000 francs (£2,520). The first twelve exhibitions of the society included more than 50,000 works of art, of which about 1,200 were purchased

either for the town of Bordeaux or by private persons in its neighbourhood; and the total receipts of the twelve fell very little short of £20,000. The Societé des Amis des Arts has received great encouragement from the authorities of the town; a special gallery has been built for their exhibitions in the public garden; and the fruit of the labours of the society is to be found in the fact that several amateurs have made donations of valuable works of art, and that the museum has been enriched by the addition of seventeen fine paintings. There are many other excellent societies of the kind in France, but that of Bordeaux is perhaps the most remarkable.

THE LOUVRE.—A very important work is about to be commenced at the Louvre. The pavilion of Flora, which forms the corner of the Palace of the Tuileries towards the river, is now completed as far as the outer walls are concerned, and the new Salle des Etats, which connects it with the grand gallery of the Louvre, is in a forward state. The next thing to be done is the entire demolition of that portion of the gallery erected during the reign of Louis XIV., and its reconstruction in harmony with the rest of the gallery. This completion of the beautiful work of Henry IV., and the removal of the hideous structure of Louis' period, will be one of the greatest improvements imaginable. Unfortunately the pictures of the Flemish school will in consequence have to be withdrawn from exhibition for a considerable period. The original design of Murillo's grand work, "The Vision of Saint François attended by Angels," from the Vallardi collection, has been presented to the Museum of the Louvre, by M. P. Jacques; it will form the most precious relic of the great Spanish painter in the Imperial collection.

FRENCH ARTISTS.—Death and suffering have fallen heavily on the artistic class during the last few weeks. Flandrin has been carried off with terrible suddenness, by disease contracted by overwork and anxiety, leaving his mural paintings in the church of St. Germain des Prés to be finished by another hand. Dubufe, father of the popular painter, died at the age of 74; he was a pupil of David, and divided his time between historical and religious subjects and portraits. In the former styles he gained considerable honour, and in the latter he was the rage during the reign of Louis Philippe, whose portrait he painted; but his grand success was with female subjects; amongst his most celebrated works in this class are likenesses of the Queen of the Belgians, and of Mademoiselle Vernon, in the "Dumb Girl of Portici." He was the Lawrence of the time of the King of the Barricades. M. Allard, a promising young painter, native of Lyons, and residing since last autumn at Rome, has been murdered by a man who sat to him as a model, for the sake of the watch which he wore, and which is said to be one of the greatest temptations possible to the lower classes in that city. The money in his pockets was untouched. Lastly, poor Troyon, the admirable painter of rural scenes and animals, has become insane, and has been placed in an asylum, with little hope of recovery. Poor Watteau. the painter of courtly and elegant pleasures, died of melancholy and consumption at Nogent-sur-Marne, where a monument was erected to his memory by his friends; this was destroyed by the revolutionists of 1793, and a new one is being erected in its place by a statuary named Auvray. A bust of the painter is to be executed at the expense of the government, and the maire has opened a subscription to defray the rest of the expenses.

PICTURE SALE IN PARIS.—A very remarkable sale occurred a short time since, that of the collection of M. Eugène Piot, one of the noted connoisseurs of Paris. M. Piot has ransacked Italy for the last twenty years for works unknown in France, and the late sale proves that he has had considerable success. The sale attracted all the amateurs within reach, and the prices obtained, though not so high, probably, as they would have been two or three months since, were good. The following are the most remarkable lots:—A bust of a child by Donatello, 1386-1468, 8,350 francs, or £334; bust of Dietisalvi Neroni, who played a great part in the republic of Florence and was a great friend of Cosmo de Medici, by Mino de Fiesole, 1406-1486, £280; a statue of the Virgin seated, with the infant Jesus standing on her knees, by Antonio Rossellino, 1427-1490, £136; the Virgin with the infant in her arms, alto-relievo, with winged Cherubim, £134; the following works by Michael Angelo—Portrait of himself, 1475-1564, a replica of that in the Audience Chamber of the Capitol at Rome, from the collection of Comte Bianchetti, of Bologna, withdrawn at £400; a statue about fifteen inches high, supposed to be the original of the colossal statue of David, £202; Samson slaying the Philistines, a group of three figures, not higher than the preceding, £241—this subject is said to have been designed as a pendant to the statue of David, but not to have been carried out—a panel of a door by Lorenzo Ghiberti, 1381-1455, representing an architectural framing with two groups, an angel delivering a prisoner, and another angel guiding a saint, £104; the Martyrdom of St. Sebastien, by Donatello, a small work, £108; and a winged child with a fish on its shoulder, a small statuette intended for a fountain, £160.

A FINE PICTURE BY RUBENS DISCOVERED.—The director of the Salle d'Orient, at Brussels, has made a fortunate discovery. At a public sale of curiosities he purchased, for ten francs, a picture covered with dust and cobwebs, and somewhat injured into the bargain, and upon having it cleaned the connoisseurs declared it to be an undoubted Rubens. The subject is, "The Tavern de la Madeleine," and the fortunate possessor has refused forty thousand francs for it.

Manufactures.

CHINA GRASS.—The manufacturers of Rouen are turning their attention seriously to the applications of China grass. The Chamber of Commerce was the first to move in the matter, a report was drawn up by M. Cordier, and specimens of the plant and its products in all stages of manufacture were exhibited to the public, and attracted considerable attention. Recently to these have been added samples of tissues of the grass mixed with wool and cotton; these are the produce of the works of M. Bertel, and have been printed by Keittinger and Sons. The landed proprietors of the departments of the Bouches-du-Rhône and the Aisne and the government have made arrangements to secure and distribute a supply of the seed.

MANUFACTURE OF FINE EARTHENWARE IN FRANCE.—It is said that the French government is about to establish a school at Nevers for the instruction of young workmen in modelling, drawing, and painting for ceramic work. Nevers was the cradle of the art in France, an Italian named Corviade having about the beginning of the fifteenth century introduced the manufacture there, and his son was appointed by Louis XIII., "*Gentilhomme faïncier*" of the king's household. Nevers fell before the Royal establishment of porcelain at Sèvres, and its *faience* was for some time forgotten; recently, however, it has sprung up again and attracted attention, and there is no doubt that the establishment of such a school as that proposed would have a great effect in aiding in the resuscitation.

PORTABLE COFFER DAM FOR CLEANING AND EXAMINING THE BOTTOMS OF SHIPS.—Capt. McKillop drew the attention of the Institution of Naval Architects to a coffer dam, consisting of a flexible iron framing and a covering of india-rubber cloth or leather, which can be passed down a ship's side so as, with the side of the ship, to form a tube from which the water can be pumped out. The vessel can by this means be either examined or cleaned, as a man may be sent down a ladder inside it. If it is merely wanted to remove fouling, the ladder may be left out and the lining of the coffer dam brought nearly

close to the ship's side, unslaked lime and other substances being dropped in from the water's edge as the machine goes down. When in position, the machine is moved along the bottom by guide ropes. The slaking of the lime destroys the grass and incrustation. Adhesion between the machine and the ship's side is secured by an inflated tube passing down each side and round the bottom of the machine. The machine may also be used to stop a leak, and may be kept on the leak during the remainder of the voyage without great detriment to speed. It can also be used as a raft.

The Atlantic Telegraph.—On the 29th April, a large party of gentlemen interested in the Atlantic Telegraph, met at the Gutta Percha Works, in Wharf-street, City-road, and witnessed every separate process of manufacturing and testing the cable. There were present, among many others, the Marquis of Tweeddale, Mr. Bright, M.P., the Hon. W. M. Evarts, Mr. Percy Salmon, Mr. Saward, Captain Hamilton, Mr. Glass, Mr. Varley, Mr. Edwards, and Professor Wheatstone. The electrical tests incidental to the operations of isolating the wire were conducted with great nicety. Fusees were fired by means of a current despatched through sixty miles of the coated wire. The manufacture of the cable differs at almost every step from the process adopted six years ago. It is nearly twice the size, and the weight of the copper strand which forms the conductor is considerably more than doubled, the number of pounds avoirdupois to the nautical mile being 300 to 107. The insulation is said to be improved, Chatterton's compound, with which the copper strand is first coated, and which alternates with the successive layers of gutta percha, binding them firmly together, and excluding air. Protection against rough external influences is obtained by substituting for the eighteen strands of charcoal-iron wire laid spirally round the core, with a padding of tar-saturated hemp between, ten solid wires of homogeneous iron, each wire surrounded separately with five strands of Manilla yarn, saturated with a preservative compound, and the whole laid spirally round the core, which latter is padded with ordinary hemp, steeped with preservative mixture. The breaking strain of the old cable was 3 tons 5 cwt.; while in the present case it is 7 tons 15 cwt., and in other essential respects great improvement has been attained. The mode of splicing is now materially improved.

Commerce.

The Export Trade of France is gradually increasing. According to the last official returns published the exports from the 1st of January to the 1st of April amounted to 692,506,000f. During the corresponding period of the year 1861 the exports amounted to 463,839,000f.; in 1862 to 507,265,000f.; in 1863 to 594,490,000f. The principal articles of which the export has increased are silk stuffs, woollen cloths, millinery, linendrapery, dressed skins, toys, wine, brandy, and chymical ingredients. The import duties increased during the same period to 40,138,000f. from 37,196,000f. in 1863, and 33,875,090f. in 1852. England is the best customer for French manufactured silks, inasmuch as she takes more than the half of all that is exported. England likewise takes more than one-half of the woollen stuffs exported from France. The best customers, however, for coarse woollen cloths are Belgium, Germany, and Italy.

The Silk Trade continues to improve at Lyons. The price of the raw material is firm, but not so high as to prevent manufacturers purchasing all they require. The scarcity of Chinese and Japanese raw silk is the only unfavourable circumstance to be remarked. The supply is not equal to the demand, and it is feared that ultimately the supply of European silk may not be sufficient. The appearance of the silkworms throughout the departments of the Isère, Var, Drôme, Gard, and Vaucluse is satisfactory. Japanese silk is becoming every day more esteemed in the French markets, but it does not reach them except through England. The raw silk exported last year from Japan amounted to 22,000 bales, of which only a small portion reached France. The merchants of Lyons and Marseilles are now making arrangements to receive silk direct from Japan. The French commission agents who have gone to Japan find more facilities there than in China. The climate of Japan is incomparably superior, and the silk grown there is finer and takes the dye better. The export of raw silk from Japan has greatly increased within late years. The entire export from the 1st of July to the 28th of October last year amounts to 6,834 bales, against 5,701 during the corresponding period of the year 1862. These 6,834 bales represent a value of more than £640,000.

Tea.—The imports of tea have experienced a great expansion this year, as compared with 1863, when a considerable corresponding progress was made. Thus the total imports during the first three months of 1864 amounted to 22,277,065 lbs. against 17,093,365 lbs. in the corresponding period of 1863, and 18,452,904 lbs. in the corresponding period of 1862. The total imports for 1863 amounted, however, to 85,206,779 lbs., as compared with 78,817,060 lbs. in 1862. A considerable portion of the increase observable in the imports for the first quarter of 1864, as compared with the corresponding three months of 1863, is accounted for by the larger exports effected this year as compared with previous quarters, the total for the three months ending March 31, 1864, having been 8,012,067 lbs. against 5,037,077 lbs. in the corresponding period of 1863, and 5,070,404 lbs. in the corresponding period of 1862.

Seed and Oil Trades.—The reported damage to the Continental rape crops has considerably enhanced prices of all seeds.

Colonies.

A Canadian Telegraph Company.—A new company has been organised in Canada, called the Provincial Telegraph Company, with which the United States Company will be connected at Suspension Bridge and at Montreal. One of the most important features of this enterprise is its probable connexion with a line to Europe, to which the attention of the public has not been called. This line is from the coast of Labrador, viâ Greenland, Iceland, and the Faroe Isles, to the north shore of Scotland. The longest distance from shore to shore is less than 500 miles —a less distance than cables are now successfully working in the Mediterranean.

Acclimatisation in the Colonies.—A Lyttelton paper says that the work of acclimatisation has been carried on with great energy during the past year, and with considerable success. The societies under whose auspices the work is promoted have been well supported pecuniarily, and their funds have enabled them to introduce numerous birds and animals from all parts of the world. Many encouraging instances of actual acclimatisation have come under notice, several of the quadrupeds and ornithological specimens that have been liberated from the preserves in which they have hitherto been kept, having been found to multiply, and apparently thrive as well as in their native homes. Acclimatisation societies have also been established in Queensland, and Invercargill, and local branches of the Victorian Society have been formed in the towns of Ballarat, Beechworth, and Portland. The New Zealand Society has made an excellent beginning, and £300 has been voted in its aid by the provincial council, £50 for the introduction of game, and £250 for salmon ova. There are obvious reasons for encouraging acclimatisation in New Zealand, a country that, though blessed with a climate well adapted to the constitution of the animals of a large portion of the world, was singularly destitute of animal life when first colonised. The receipts of the Victoria

Acclimatisation Society for the last year were £3,595 14s., including a government grant of £2,400. There is every probability that the British salmon will shortly be introduced into Tasmania, where the acclimatisation society have made arrangements for securing a supply of ova. The gouramy, from the Mauritius, has been actually landed alive at Adelaide, and there is no reason to doubt that this excellent pond fish will shortly be established in the colony. A reservoir near Melbourne has been supplied with English tench, and other reservoirs are stocked with English dace. The Murray cod is now completely established in several of the rivers.

MELBOURNE.—A private letter says that business has been lately very dull. The prevailing inactivity is attributable to two causes, viz., the uncertainty existing with regard to the fate of the customs duties bill, and the inclemency of the weather. The former has been read twice in the legislative council, but it is not thought that it will be read a third time in its present form. There has been a great deal of rain lately, and floods have again occurred at Maitland, on the Hunter River, which have done a great deal of damage. Another cause of the existing depression is the bad harvest, inasmuch as the loss of the crops has impoverished many of the small farmers, who are consequently in many cases obliged to do without the necessaries of life almost, which acts directly on the country storekeepers, through them on the trade. Sydney. Money has been scarce of late.

Notes.

STEAM PLOUGHING IN FRANCE.—A steam ploughing match, under Imperial auspices, has recently come off at Roanne. The novelty of the operations, in a district characterised by its primitive modes of agriculture, attracted a large concourse of spectators. Several French engineers took part in the competition, and appeared very confident of success; but the first prize of £100 and the gold medal have come to England, the winners being Messrs. James and Frederick Howard, of Bedford.

EXHIBITION OF BUILDING MATERIALS.—An exhibition of all the matters employed in construction, rough and in any stage of preparation, is announced to take place at Olten, in the canton of Soleure, Switzerland, on the 18th of August. The matter has been taken up very warmly by the Swiss authorities, and the railway companies have offered to convey exhibitors, visitors, and materials at half the usual prices.

BRITISH MUSEUM.—The annual accounts of the British Museum have been laid before Parliament. The entire expenditure in the past year has amounted to £95,000, of which about half went in salaries and incidentals, and the other half in purchases and in the expense of repairs and maintenance of the building, the rooms and the collections, and in bookbinding. The attendance of the public to view the general collections fell to 440,801 in the year 1863—less than half the attendance in 1862 (the Exhibition year), and a smaller number than for several years past. The number of visits to the reading-room also declined considerably, falling from a number always of late years exceeding 120,000 to 107,821, or an average of 372 a day on the 200 days on which the room was open. Each reader consulted on an average 11 volumes in the day, and the whole number of volumes consulted in the year is estimated at 1,222,484. The total number of articles added to the library in the course of the year, including newspapers, broadsides, engravings, maps, and miscellaneous pieces, was 107,784. Of complete works 45,020 were purchased, 10,072 acquired by copyright, and 1,129 presented. In the natural history departments above 100,000 specimens have been added in the course of the past year, and Professor Owen reports that, although the extent of previous acquisitions leads to ever-increasing reticence and care in selection, the progress of the additions is such as fully to verify the anticipations on which the requirements of space have been estimated. The additions include specimens from the African expeditions and the North American boundary expedition, and contributions of great scientific value from the Linnæan and Entomological Societies. The department of zoology has been enriched by a donation from Mr. J. Bowring of above 80,000 specimens of coleoptorous insects, the largest and most instructive accession to the entomological department ever presented by one individual. Very large additions have been made to the collection of fishes; among them may be mentioned a collection from the Lake of Galilee. Valuable additions were made also to the other departments—the botanical, mineralogy, geology, antiquities, and ethnography, coins and medals, prints and drawings.

NEW NATIONAL GALLERY.—An estimate has been presented to Parliament proposing a vote of £10,000, the first instalment of £152,000, which is the estimated cost of building a new National Gallery at Burlington-house, including finishings and decoration. In forwarding the estimate, the First Commissioner of Works states that the estimate is for the erection of the National Gallery on the site purchased by the Government in Piccadilly, consisting of about three and a-half acres, of which one-half is occupied by Burlington-house, with its two wings and its colonnade, and by the courtyard which they surround. These buildings are occupied by the Royal and other societies, which need not be disturbed at present, since the garden, which occupies half of the site, will furnish ample accommodation for the pictures, ancient and modern, belonging to the trustees of the National Gallery, and also for the additions to the collections which may be expected by gift and purchase for many years to come. Whenever, however, a large increase of space may be required, Burlington-house and its wings will be pulled down to make room for an extension of the National Gallery, and in the meantime the courtyard will make a handsome and convenient approach to the main entrance of the new building, which will be through the central hall of Burlington-house. The proposed building will be 300ft. long and 218ft. wide. That part of it which will be devoted to the exhibition of pictures will be of one story, lit from the ceiling, and will provide 3,000 lineal feet of wall-space in a horizontal line, exclusive of doorways, and 36,200 superficial feet of floor space. The larger galleries will be 40ft. wide and 40ft. high, and the rooms for small pictures will be 21 ft. wide, with a proportionate height. The only external elevation that will be visible will be at the northern side, in Burlington-gardens, where the board-room and offices of the trustees and the residence of the keeper will be placed in two stories, and where there will be a public entrance. On the southern side, where the level of the ground is lower, there will be a useful basement story, and the whole building will be of firepoof construction.

Correspondence.

VACANT NICHES IN LONDON.—SIR,—The letter of "Complete your Work," in your last number, touches on a subject that I have long thought deserving attention, and I hope it may claim to some good purpose the notice of the Society of Arts. Excellent statues, in stone and terra cotta, can doubtless be produced, and such, in the atmosphere of London, would probably be quite as durable as marble, and far less costly. Your correspondent has alluded to the massive unoccupied pedestals that adorn the space in front of the British Museum, and he might have cited those in Trafalgar-square. I would, however, call attention to the numerous niches, all untenanted, which occur in the outer walls of St. Paul's Cathedral, and the twelve or fourteen suited for statues or vases in the Cornhill front of the Bank of England. There are

also vacant niches in Newgate, but as the position might not be thought honourable, except in the eyes of an architect, perhaps they had better be reserved for mythological personages.—I am, &c., Constant Reader.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...British Architects, 8.
R. United Service Inst., 8½. Commander R. A. Scott, R.N., "Progress of Ordnance Abroad. — Subject continued. American Heavy Guns."
Tues. ...Statistical, 8. 1. Mr. P. M. Tait, "The Mortality of Eurasians." 2. Mr. W. G. Lumley, "The Statistics of Roman Catholics in England."
Royal Inst., 3. Professor Marshall, "On Animal Life."
Pathological, 8.
Anthropological, 8.
Civil Engineers, 8. Mr. G. R. Burnell, "On the Machinery employed in Sinking Artesian Wells on the Continent."
Wed....Society of Arts, 8. Mr. James Lowe, "On Oyster Culture."
Pharmaceutical, 11 a.m. Annual Meeting.
R. Society of Literature, 4½.
Thur. ...Chemical, 8. 1. Dr. Gladstone, "Chlorophosphide of Nitrogen." 2. Mr. Dancer, "Constitution of Wood Spirit." 3. Drs. Williamson and Russell, "Apparatus for Gas Analysis." 4. Dr. Williamson, "Atomic Weights of Metals."
Numismatic, 7.
Zoological, 4.
Royal Inst., 3. Mr. John Hullah, "On Music (1600—1750)."
Fri.......Philological, 8. Annual Meeting.
Royal Inst., 8. Mr. James Nasmyth, "On Day and Night in the Moon."
Sat ......Royal Inst., 3. Mr. Alex. Herschel, "On Falling Stars, &c."

Patents.

From Commissioners of Patents Journal, May 6th.

Grants of Provisional Protection.

Aniline dyes, purple, violet, and blue—981—H. Levinstein.
Animal matters, preservation of—959—W. Clark.
Artificial leather—1001—H. A. Bonneville.
Bonnet and hat falls—1055—J. White.
Boots—1020—S. F. Feldman.
Brick-making machinery—1030 - J. M. Pratt.
Bricks, tiles, &c.—1002—J. Jones.
Cables, submarine electric telegraph—1013—J. R. Croskey.
Caissons, coffer dams, &c.—1005—J. G. Jennings.
Capsules, metallic—953—J. H. Johnson.
Carding engines—1039—H. Marsden.
Carriages, construction of—946—A. H. A. Durant and W. H. P. Gore.
Cerealine, manufacture of—965—A. V. Newton.
Cereals, apparatus for sifting or sorting—962—W. E. Gedge.
College caps—1028—D. Lewis.
Condenser, continuous self-acting—983—J. Brière.
Corn seed and manure, drills to sow or deposit—1032—J. J. Smyth.
Cotton gins—839—T. Bourne.
Cotton gins—1006—J. G. Rollins.
Cotton seed, treatment of, to separate the cotton from—977—G. Burstall.
Cotton seeds, treating a product from the oil of—952—C. Doughty and W. D. Key.
Cranes, crab winches, &c.—942—S. Moore.
Doors, &c., preventing the slamming of—948—W. Ovenden, sen., and W. Ovenden, jun.
Engines, motive power—932—T. W. Miller.
Engines, rotatory—963—M. B. Cooper.
Electric telegraph apparatus—940—J. McElroy.
Fluid pressure, signalling by means of—800—J. P. Ferris and K. H. Cornish.
Fluids, apparatus for raising and forcing—1026—T. P. Tregaskis.
Fire-grates—987—S. Harrison and W. Clements.
Garments, &c., spring hook or fastening for—1016—W. L. Barnes.
Gas, manufacture of—990—A. C. Fraser.
Gates and doors, fastening for—976 - J. E. Spratt.
Gun carriages, checking the recoil of—950—G. W. Rendel.
Harness, &c., apparatus for cleaning the metal parts of—1059—R. A. Brooman.
Hoeing land, machinery for—960—A. Priest and W. Woolnough, jun.
Hollow axles and axle boxes, &c.—1018—J. Thompson.
Inhaling apparatus - 1012 G. Davies.
Iron caissons, sinking of, for foundations under water—980—J. Shaw.
Iron, &c., facilitating the puddling of—1036—H. Bennett.
Jacquard cards, machinery for connecting—1041—W. E. Newton.
Keyless watches—967—W. Ehrhardt.
Knapsacks, &c., mode of carrying—1019—T. S. Truss.
Liquids, apparatus for measuring—961—W. Payton.
Looms—982—W. G. Cooper and J. Fletcher.
Looms 1029—D. Hussey.
Lubricators—1014—J. C. Rivett.
Madder, treating products of—925—F. A. Gatty.
Magnesium wire, apparatus for burning—870—E. Aldis.
Manures, preparation of—955—J. C. Coombe.
Oils, distilling and purifying hydro carbon—1019—J. E. Duyck.
Omnibuses—1057—T. L. Southgate.
Oysters, propagation of—1040—W. Crofts.
Paper, machinery for drying—975—J. Stevens.
Pens—997—W. Clark.
Photographic apparatus—1000—H. A. Bonneville.
Photographic pictures photogenically indelible—1060—R. A. Brooman.
Pianofortes, &c., tuning of—912—R. A. Kemp.
Plated wares, ornamentation of—984—G. Green.
Portmanteaus, &c., construction of—882—E. Pratt.
Projectiles—989—J. P. Harriss.
Puddling furnaces—988—J. H. Johnson.
Pulleys and riggers—1015—W. Clark.
Pumps—894—M. Benson.
Pumps, rotary—1045—G. Haseltine.
Railway carriages, &c., lighting of—944—W. Symons.
Railway chairs, hollow iron keys or wedges for fixing rails in—1035—F. G. Grice and H. Bennett.
Railways, working points and signals of—996—H. Wadkin.
Respiratory apparatus—974—G. Davies.
Ropes and cordage—986—S. S. Robson.
Rotary engine for forcing air or water—1022—A. V. Newton.
Saw blades, &c., apparatus for hardening—1037—J. Dodge.
Ships and forts, lifting battery applicable to—1004—L. Thomas.
Ships, construction of—954—W. Clark.
Sizing substance—964—J. Riley.
Skirts, manufacture of—973—J. C. A. Henderson.
Smoke consuming apparatus—1034—R. North.
Smoking pipes—1027—A. Wardle.
Spinning and doubling, self acting mules for—994—J. Standeven.
Stamps, &c., in relief 1008—A. Leighton.
Steam boats, paddle wheels for—1061—S. Bateman.
Steam engines and boilers—951—E. Rowing.
Steam engines, slide valves of—956—H. B. Barlow.
Steam hammers - 995—J. Armstrong.
Structures, foundations for heavy - 985—J. Head, jun.
Surfaces, material for grinding and polishing—1003—G. P. Wheeler.
Surfaces, wheels or tools for grinding and polishing—1062—E. J. W. Parnacott.
Table tops, fastening of, without thumb screws—979—J. Edis.
Tobacco pipes, apparatus for cleaning—957—C. H. Prosser.
Trimmings, hand frames used for embroidered—939—F. Browett.
Valve, equilibrium slide—991—W. E. Newton.
Vessels, means of propelling—938—Y. Meirat.
Water closet apparatus—958—J. A. Nicholson.
Wheel dressing machines—1053—H. S. Jacobs.
Window blinds, &c., rack pullies for—1042—A. J. Billing and J. Shore.

Invention with Complete Specification Filed.

Trees and timber, felling and splitting - 1068—C. H. Pearson.

Patents Sealed.

2790. J. Ramsbottom.
2801. T. M. Reade and J. Hewitt.
2804. A. C. Drust-Wild.
2806. W. D. Richards.
2814. J., J., and J. Booth.
2815. A. Illingworth.
2816. H. Holden.
2820. D. Ford.
2822. L. E. C. Martin.
2825. D. M. Fyfe.
2829. W. Chambers.
2833. F. Spencer and J. Dodd.
2848. T. S. Prideaux.
3240. J. Gjers.
3273. J. Gjers.
3281. T. Tozer.
349. J. B. Borgatta.

From Commissioners of Patents Journal, May 10th.

Patents Sealed.

2813. B. Peake.
2819. W. E. Gedge.
2840. H. Gladstone.
2845. E. T. Hughes.
2846. E. Hargraves.
2847. A. Ellissen.
2849. G. Barker.
2853. G. Lindemann.
2855. L. Mackirdy.
2856. R. A. Brooman.
2858. R. A. Brooman.
2861. J. Walmsley.
2862. J. Hulse and J. Lawrence.
2863. E. and F. A. Leigh.
2865. S. Cameron and W. Johnston.
2866. G. Thonger.
2867. E. W. Elmslie.
2876. P. M. Parsons.
2880. J. Betteley.
2889. J. Elder.
2890. J. Stewart.
2898. J. Elder.
2908. W. Symons.
2943. C. Howard.
2947. T. Carr.
3047. R. Riley.
3084. J. Wray.
167. R. Irvine, T. Richardson, and J. J. Lundy.
176. W. Clark.
271. E. Harrison.
398. W. Clark.
491. P. H. Muntz.
665. A. V. Newton.
731. A. Morel.
732. A. Morel.

Patents on which the Stamp Duty of £50 has been Paid.

1115. J. A. Manning.
1165. J. Fitter.
1109. M. A. F. Mennons.
1123. W. Rowan.
1128. E. P. Smith.
1293. W. P. Dreaper.
1145. J. Burch.
1134. T. Blackburn and M. Knowles.
1138. W. Johnson.
1175. J. Burch.

Patents on which the Stamp Duty of £100 has been Paid.

1273. L. Bissell.
1255. W. E. Wiley.
1303. C. E. Darby.
1316. H. Hobbs and E. Easton.
1317. R. Wilson.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, MAY 20, 1864. [No. 600. VOL. XII.

Announcements by the Council.

PRESENTATION OF MEDALS AND PRIZES.

His Royal Highness the Prince of Wales, K.G., President of the Society, has been pleased to appoint Friday, the 24th of June, at three o'clock, to present the medals and prizes awarded during the present Session. The Presentation will take place at Willis's Rooms, King-street, St. James's. Members will be admitted by ticket only, for which application should be made to the Secretary; each ticket to admit the member and one lady. The tickets will be ready for delivery on and after the 1st June.

ORDINARY MEETINGS.

Wednesday Evenings, at 8 o'clock.

May 25.—Derby-day. NO MEETING.

COTTAGES FOR THE LABOURING CLASSES.

A Special Conference will be held at the Society's House, on Thursday, the 26th, and Friday, the 27th inst., to which the Council invite all those members of the Society of Arts who have seats in the Legislature, such other members as are known to take a special interest in the subject, the Presidents of the Institutions in Union with the Society, and other noblemen and gentlemen whose co-operation may be deemed important.

The Conference each day will be opened at 11·30 *precisely*, and closed not later than 4 o'clock, the chair being taken by the Chairman of the Council.

The discussion will be taken:—

1. On the insufficient number of habitations for the labouring classes in town and country.
2. On the badness of the existing accommodation.
3. On the effects arising from this state of things, viz.:—
   (*A*) Religious, moral, and social.
   (*B*) Sanitary.
   (*C*) Economic.
4. On the causes to which these evils may be, or have been, attributed, such as—
   (*A*) The Law of Settlement.
   (*B*) The Poor Laws.
   (*C*) Tenure of property, such as mortmain, leasehold system, tenancy for life, &c.
   (*D*) Legal difficulties affecting the transfer of property.
   (*E*) Difficulty of providing proper dwellings at a cost which will be remunerative to capital in town and country.
5. Remedies:—
   (*A*) What can be done by Legislation?
   (*B*) What can be done without Legislation?
   (*C*) What assistance, if any, can the Society give in either of these directions?

The various plans sent in, in competition for the prizes offered by Mr. J. Bailey Denton, through the Society, are now hung on the walls of the meeting-room, and may be inspected by the members and their friends.

STATISTICS OF MODEL DWELLINGS.

The report of the Committee appointed by the Council to consider this subject, consisting of the Hon. and Rev. Samuel Best, Mr. Samuel Gregson, M.P., Mr. Chandos Wren Hoskyns, Mr. Thomas Twining, Mr. Henry M. Eyton (architect), and Mr. George C. Rigby (builder), has been published, and any member of the Society interested in the subject may have copies on application to the Secretary. This inquiry was originated at the suggestion of Mr. Twining, who has also kindly defrayed the expenses of it, and of the publication of the report.

Proceedings of the Society.

TWENTY-SECOND ORDINARY MEETING.

Wednesday, May 18th, 1864; Wm. Hawes, Esq., Chairman of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Callender, William Romaine, F.S.A., Victoria-park, Manchester.
Campbell, Rev. William, Privy Council Office, S.W.
Johnston, William, 32, Buckingham-terrace, Glasgow.
Locke, John, 83, Addison-road, Kensington, W.

The following candidate was balloted for and duly elected a member of the Society:—

Wilson, John Peter, 40, Addison-gardens North, Kensington, W.

The Paper read was—

OYSTER CULTURE.

By James Lowe, Esq., Joint Secretary of the Acclimatisation Society of Great Britain.

Oyster culture is the art of promoting the reproduction and improvement of oysters by artificial means. It is an art, because, although its processes are founded upon natural laws, the application of those laws is artificial; it is a method of cultivation, because it improves, both in quantity and quality, upon what is produced in a natural manner.

Oyster culture, like many very valuable arts, is an ancient one. I do not propose to occupy the time of the members by entering, at any very great length, into the history of oyster culture, as it was practised by the ancients, from whom it has been handed down to us in what is, apparently, a continuity of practice. This has been gone into very fully in the writings which the eminent French pisciculturist, M. Coste, has published on the subject, and from thence most of the information attainable as to that branch of the subject has filtrated into numerous essays and articles, which have appeared in periodicals and journals, both at home and abroad. There are, however, one or two points connected with the ancient knowledge and practice of the subject which are worthy of a passing notice.

There seems to be no record that oyster culture was practised by any people more ancient than the Romans. In the East, the birthplace of science, the oyster was not used as an article of food; and the teeming waters of the Indian ocean produced the pearl-bearing oysters and mussels in too great abundance to seem to require the aid of any artificial processes. The Romans were the first people to pay much attention to this bivalve, and they prized it highly as an article of food. The operations of Sergius Orata, that ingenious Roman who cultivated oysters in an artificial manner at Baiæ and along the shores of the Lucrine lake, have been often referred to; and I shall only allude to them for the purpose of pointing out the possibility that when Considius, the orator who was employed to prosecute him for trespassing upon the public right to the waters of the lake, said of him that he could cultivate oysters *in tegulis*, he may have alluded to the employment of roof-tiles as apparatus for collecting the spat. Some of the methods adopted by the Romans have been handed down without interruption by the inhabitants of the shores of the Lake Fusaro, where oyster culture is carried on to this day, and where the spat is collected upon piles driven into the ground, with boughs of trees interwoven and fascines of branches sunk to the bottom of the lake.

Some passages which Pliny the Elder wrote upon the habits and nature of the oyster, are exceedingly instructive, and it may be doubted whether the researches of modern cultivators have enabled them to add much to that which this eminent Roman naturalist tells us of the fish.

"Oysters love fresh water and spots where numerous rivers discharge themselves into the sea; hence it is that the pelagia are of so small size and so few in number. Still, however, we do find them breeding among rocks and in places far remote from the contact of fresh water, as in the neighbourhood of Grynium and of Myrina, for example. Generally speaking, they increase in size with the increase of the moon, as already stated by us when treating of the aquatic animals; but it is at the beginning of summer more particularly, and when the rays of the sun penetrate the shallow waters, that they are swollen with an abundance of milk. This, too, would appear to be the reason why they are so small when found out at sea; the opacity of the water tending to arrest their growth, and the moping consequent thereon producing a comparative indisposition for food.

"Oysters are of various colours; in Spain they are red, in Illyricum of a tawny hue, and at Circeii black, both in meat and shell. But in every country, those oysters are the most highly esteemed that are compact without being slimy from their secretions, and are remarkable more for their thickness than their breadth. They should never be taken in either muddy or sandy spots, but from a firm, hard bottom; the meat should be compressed, and not of a fleshy consistence; and the oyster should be free from fringed edges, and lying wholly in the cavity of the shell. Persons of experience in these matters add another characteristic; a fine purple thread, they say, should run round the margins of the beard, this being looked upon as a sign of superior quality, and obtaining for them their name of 'calliblephara.'

"Oysters are all the better for travelling and being removed to new waters: thus, for example, the oysters of Brundisium, it is thought, when fed in the waters of Avernus, both retain their own native juices and acquire the flavour of those of Lake Lucrinus. Thus much with reference to the meat of the oyster."

It is interesting to know that although the Roman epicures highly prized the oysters of the Mediterranean, reared and fattened in Lake Lucrinus, they cheerfully acknowledged the superiority of the British "native," as soon as the enterprise of their navy enabled them to enjoy that delicate bivalve. Juvenal makes mention of an epicure in oysters—a kind of Roman Dando—whose palate was so skilled that he could distinguish without any difficulty the oysters of one place from those which came from another. The British oysters most highly spoken of were those which came from Rutupium —the modern Richborough.

I shall not detain you with many arguments to prove the necessity for doing something to increase the productiveness of the oyster. The fact that this delicious and nutritious bivalve is rapidly becoming rarer and rarer, and the strong probability that, if unassisted, it must ere long become unknown as an article of food, has been of late years becoming more and more painfully apparent. This consequence is due to no sudden accident or unexpected cause. Fifteen years ago, the eminent French naturalist, M. de Quatrefages, drew the attention of the Académie des Sciences to the fact that "many beds of oysters, whose produce furnished the means of livelihood to the fishing populations of the shores of the Channel, have now become so impoverished that they have been abandoned."

Six years ago (that is to say in 1858), the gradual increase in the price of oysters in France, consequent upon the increasing scarcity of the fish, attracted the attention of M. Coste, the celebrated pisciculturist—the man who has perhaps done more for the good of his fellows (by pointing out the way to cultivate the water as the farmer cultivates the land) than any other man alive. It was high time indeed that something should be done; for the localities upon the shores of France once most celebrated for their abundant supply of oysters, were becoming totally destitute of the fish.

In February, 1858, M. Coste pointed out that the oyster-fishery was falling into such a state that, unless prompt measures were taken for its revival, it must ere long cease to exist. At Rochelle, Marennes, Rochefort, the Iles de Ré and Oléron, out of twenty-three beds which once formed part of the wealth of that coast, eighteen were entirely ruined, whilst those which still were productive to a certain extent were seriously injured by the increasing invasion of mussels. The Bay of St. Brieuc once had 15 beds of oysters in full activity, and 1,400 men, with 200 boats, were employed in dredging. In February, 1858 (when M. Coste reported upon the matter to the Emperor) there were only 20 boats and about 150 men. Thanks to the operations since carried out by M. Coste, at the expense of the State, the Bay of St. Brieuc is once more richly stocked; but at Cancale, a locality once celebrated for the quality and quantity of its oysters, and where nothing has yet been done to mend the mischief, things are now in a very bad way. Last August, I myself visited that place, and found a lamentable state of things.

Of three hundred boats which, but a few years ago, were actively employed in the oyster-dredging, not fifty could find full employment from that alone, nor, indeed, could more than an insignificant number be kept afloat were it not for the general fishing of the place. On the shore of the bay, where the oysters are laid out in *claires* and *étalages* to fatten and get into condition, I spoke with a man who been connected with the oyster trade for many years. He told me that the number of oysters dredged from the deep-sea beds in the neighbourhood, for use at Cancale during the current season, had then mounted up to little more than three millions seven hundred thousand, whereas twelve years ago, at the same period of the season, the total would be sixty millions. If I were to go on all night adding illustration to illustration in proof of the gradual disappearance of the oyster from localities where means are not being taken to allow nature fair play, I could give no better than this. In a word, at Cancale the dredgers have realized the old fable of "Killing the goose which laid the golden eggs."

For proof, however, of the gradual disappearance of the fish, need we seek much further than the oyster-shops of our own metropolis? The prices which the wholesale price of oysters in the market compels such dealers as Rule, Sweeting, and Pim, to charge us for our favourite supper or lunch, furnish the most home proof possible of the calamity which is a-head. Three years ago, the best native oysters were sold at forty shillings the bushel; they (that is to say, the Whitstables, which are the best) are now at seventy shillings. Burnhams, Black Rocks, Swansea, and the common sorts, are quoted at lower prices. When I mention that more than 150,000 bushels of oysters are brought to Billingsgate every year, some idea may be formed of the commercial importance of the oyster. To the consumer, this increase of price is very important. Most of us can remember, without carrying the memory very far back, a time when native oysters were sold for 4d. the dozen; more lately they were 6d.; then 8d., and at many first-class fishmongers 10d. is now demanded—indeed, at the wholesale prices which have to be paid by the dealers, I do not see how they can be sold for less. It is confidently stated that, unless something be done to assist nature in supplying the enormous demand made upon her resources, oysters will soon be a shilling the dozen. In St. Petersburgh and Moscow, where the British oyster is as much valued as it was in ancient Rome, and whither large numbers of our "natives" are sent, from three to four shillings per dozen is the price freely paid—so fond are the Russians of that delicious little bivalve which has been justly termed "the pearl of oysters."

Thanks to M. Coste and the able and zealous men who are working with him in the same direction, the oyster fisheries of France are in a fair way of being saved, and the cultivation of the oyster, which is now being carried on in various localities, has already reached an extent which will, no doubt, cause a very material addition to the natural wealth of the country. In the papers which I have written on the subject in the *Field* newspaper, I have given an account of the principal features of this vast national operation—the methods employed by M. Coste for refertilising the depopulated bay of St. Brieuc, the construction and management of the Imperial Oyster Park at Concarneau, and the operations on the shores of the Ile de Ré, where oyster-culture has indeed assumed magnificent proportions. I need not now recapitulate those interesting particulars; but I may state that, on the Ile de Ré alone there are now nearly 4,000 oyster parks, producing wealth and food upon what has hitherto been barren shore. A few passages from M. Coste's report on the subject, will serve to give an idea of what is being done there. It is dated Paris, 1861. He says:—

"The notion of cultivating the sea is no longer a doubtful promise on the part of science, which disparagement (that parasite inseparable from truth) can classify as a chimera, which it has done in turn by every great discovery which is now the glory of the human race. By entering into the minds of the populations of our shores, this idea has transformed the ocean into a food-manufactory, wherein industry may cultivate its harvest at its pleasure, so that, submitting organised nature to its influence, by a sovereign application of the laws of life it turns our shores into fields of plenty, capable of supplying all the markets of Europe.

"In the Ile de Ré, for example, more than 3,000 men, formerly disassociated from the tenure of the soil, have come from the interior to the shores to take possession of submerged lands, which the Government has conceded to them by lot, for the purpose of giving to each his particular interest in the common work. The courageous perseverance of this army of workers has given way neither before the necessity of clearing away the immense tracts of mud which for several leagues covered that sterile domain, nor before the difficulty of obtaining materials for the parks destined to bring it into a state of profitable cultivation

"They have detached, by blasting and the pick, the rocky ridges which bordered their island, and with the fragments they have constructed inclosures over the whole surface of the shore. Then within these inclosures they arranged stones vertically, and sufficiently near to each other, so that the retiring wave, broken by these obstacles, may be divided into rapid currents, and sweep the mud towards the point where, by inclined planes, it is conducted towards a kind of collecting sewer, and so conveyed out of the park. Every park thus arranged becomes, as it were, a cleansing apparatus, which the water converts into a productive field.

"There are already (this was in 1861) 1,500 of these parks in full work, arranged with the regularity of houses in a town, with broad roads for the use of vehicles and paths for foot passengers. These stretch from the Pointe de Rivedoux to the Pointe de Loix, a distance of nearly four French leagues, and covering a superficial surface of upwards of 750,000 square yards—a gigantic work, accomplished with a zeal unparalleled in the island. In addition to this, about 2,000 new parks are in the course of construction.

"Scarcely had the submerged lands which are the theatre of this marvellous conquest undergone the preparation necessary to cause them to bear fruit, when the seed, conducted thither by the currents, spread over them and covered every point of adhesion in incredible profusion. The fragments of rock which formed the walls of the parks, and those which had been placed within the spaces which those walls circumscribed, disappeared beneath the immense deposit of oysters—soon to become marketable, as the soil in our pastures is clothed by the ripe herbage which grows upon it. It is a fact, which everyone may verify at his pleasure, that when the sea leaves these inclosures dry, you may gather, with dry feet, the crop of shell-fish as readily as if you were picking fruit in a vineyard or kitchen garden.

"The local government agents estimate, as a mean, five hundred oysters to the square yard; and this calculation gives for all the parks in work a total of about 375,000,000 of oysters, representing a value of from six to eight millions of francs (£240,000 to £320,000 sterling)."

Before describing the methods of cultivation employed by these modern cultivators, a few statements as to the reproduction of the oyster will not be out of place. Until a very recent period, naturalists of eminence seem to have been in considerable doubt as to the sexual character of the oyster. In 1849, M. de Quatrefages announced it as his opinion that they were of two sexes; but, since then, M. Coste (who to the character of a zealous pisciculturist adds that of a careful and scientific embryologist) has determined, beyond all possibility of dispute, that this bivalve is hermaphrodite. The mode in which it reproduces is curious and interesting. In the month of May, the oyster gets into what is known as the milky state; this lasts until the month of August, and this is

the season of spawning. For this reason, the oyster is said to be unfit to be eaten when there is an R in the month. When the oyster produces its eggs, it does not cast them forth, but keeps them adhering to the outer folds of its shell, as the lobster does. A well-grown oyster will produce an immense quantity of eggs, which have been estimated to number from one to two millions. I am not aware how this calculation has been verified, but it is accepted as true by experienced observers. During incubation, these eggs cling to the laminæ of the shell, where they lie covered by a mucous cloak, which changes in colour from cream colour to transparent yellow; it then becomes opaque, and finally degenerates into a grayish-brown, or very deep violet grey. The mass hardens, and remains firmly fixed upon the shell, until the mother, by an effort, throws off this progeny from her sides. The appearance of these myriads of embryos, as they are violently ejected through the water, has been described as "a cloud of spawn."

Now, under ordinary circumstances, when this operation takes place in a deep-sea oyster-bed, the chance of each individual embryo surviving and growing up to respectable oysterhood is very remote indeed. Carried away by the currents or by floating weeds, choked in mud, ground to pieces by rolling shingle, or devoured in myriads by the infinite variety of creatures who pasture upon such food, all but a very few perish. How many survive out of the one or two millions can scarcely be told. Some say five or six; others, more sanguine, say twenty. For my part, I do not see how it is possible to arrive at any fixed proportion; much must depend upon circumstances. At any rate, whatever the number may be, it is evidently very small in proportion to the production; and we may safely suppose that the extraordinary fecundity of the oyster is not without its use, when we find that out of millions produced under ordinary circumstances, only units survive. To protect these embryos; to give them opportunities of fixing themselves, to secure points of adhesion, where they may grow and fatten, and become wholesome food at their leisure, protected from waves, shingle, mud, natural enemies, and all other dangers which threaten them; such are the objects of oyster-culture. I shall now proceed to describe the means whereby this is effected.

When the young and undeveloped oyster quits the fold of the parental shell, it is provided for the time with an apparatus for swimming. This is a kind of pad or cushion, covered thickly with cilia, and furnished with powerful muscles, which enable it to expand or contract. By means of this apparatus it swims about, until it can find something to attach itself to. When the young oyster has fixed itself in the place whereit is to grow and becomes stationary, the pad, being thenceforth useless, dwindles away little by little and finally disappears. When the oyster first attaches itself it is scarcely so big as that popular standard of measure a pin's point, but it soon begins to grow. I cannot give you a better idea of the rapidity of its growth than by a drawing of a piece of wood with oysters of various sizes attached. I have to thank M. Coste for copies of the beautiful engravings from which these photographs were taken by Mr. Poulton. They are printed in his magnificent "Voyage d'Exploration sur le Littoral de la France;" and, by the liberality of the Imperial Minister of Agriculture, at the instance of M. Coste, copies of the blocks have been furnished to me from the Imprimerie Impériale. The rapidity with which oysters reach maturity depends very much upon the locality in which they are bred. In the best places, that is to say, with everything in their favour, they will attain to the dignity of being eatable in eighteen months; in places unfavourable to their growth they will be six years in attaining this state. The medium period is three years, and this is the time required for oysters in places moderately favourable to their development. The age of an oyster is calculable by the number of laminæ in his shell. As old Pliny tells us, "they increase with the moon," and every month (possibly by some strange sympathy between the creature and the tides) is marked by an extension of the edge of the shell, the laminæ of which sprout forth in a delicate translucent fringe, as the creature renovates, expands and extends its calcareous mantle by deposits inside the shell. The French call this the beard of the shell, and also *la croissance d'une lune.*

The artificial cultivation of the oyster, as it is now practised by the French cultivators, is carried on upon the foreshores—that part of the shore that lies between high and low water mark. The shore is divided into separate allotments by low walls, built of rough stone or shingle, which have no other purpose than to divide the allotments. Each allotment is called a park, a term which has been applied in the British oyster fisheries to portions of the foreshores where oysters are laid down to fatten for the market. The parks of the French cultivators are, however, provided with apparatus for collecting the spat or spawn, which I shall presently describe. In addition to these *parcs* the French oyster-culturists have *étalages,* which answer to the English parks, places on the foreshore where oysters are laid down to fatten and get ready for the market. A *claire* is an enclosure, constructed on the upper part of the foreshore, with low walls, sufficiently water-tight to keep a few inches of water over the oysters. A *vivier* is a tidal pond, in which the water can be renewed twice a day, and where oysters or any other kind of fish can be stored. If I were to attempt any description of the circumstances most favourable for these various arrangements, it would require more time than you could spare. It will be sufficient to state that a firm, sheltered shore, free from weeds and mussels, and with just a little, but not too much mud, is best fitted for an oyster park. For getting oysters into condition a contribution of fresh water from a rivulet or stream, so as to make the salt water brackish, is to be recommended.

I now come to the various kinds of collecting apparatus used by the French cultivators. For large operations, in a considerable depth of water, like that which M. Coste carried out so successfully when he restocked the Bay of Brieuc, nothing is better than large fascines of branches bound together with a thin chain of galvanised iron, and sunk by means of a heavy stone. Upon these branches, when the weed is not too abundant, the spat collects in abundance, and I have seen branches covered with this novel efflorescence which might not inaptly be compared to the Maythorn in blossom. For the parks upon the foreshore other means are adopted. The most cumbrous of these is the collecting-floor—a construction of piles and planks, under which the mother oysters are laid, and which receive the spat upon the under-surfaces of the planks. These floors, however, can only be of use in very exceptional situations; and as a means of efficient working in a park they are not to be compared for one moment with the collecting-tile, especially those which have been invented by Dr. Kemmerer, the able and zealous oyster-culturist of the Ile de Ré.

I pass over the collecting-boxes or hives, which have also been superseded by Dr. Kemmerer's inventions, and come at once to the collecting-tiles. They are the common roof-tiles to which I alluded when I said it was possible that Sergius Orata used them in his ostreocultural operations. They are used plain, or covered with cement on the inner side, with shells embedded in the cement, or small faggots suspended there by means of galvanised wire. The great advantages of these tiles are that they are cheap, easily replaced, and easy to manage. They can be arranged in the manner best suited to the peculiarities of the locality, either by supporting them on posts or poles, to keep them out of the mud, or by ranging them against each other, or by piling them in the form considered best. Their business is to offer to the spawn, at the time when it is floating about, a fit resting-place to fix itself upon, and attain years of maturity. Not the least of their merits is that they may be marked, so as to be identified easily. Here are specimens of various kinds. The plain tile, marked with

the letter O, as a badge of ownership; the cemented tile; the shell tile; and the faggot tile. The great advantage which tiles, and especially cemented or otherwise prepared tiles, have over any other mode of collection, is that they are so thoroughly manageable, and that they enable the collector to remove the oysters as soon as they are large enough, and lay them flat in the *étalage* to grow shapely. Perhaps the worst kind of collecting apparatus is a piece of stone. It is not so easy to chip an oyster off a piece of granite when it has distorted itself to become accommodated to the irregular formation of the stone. A specimen which I shall now show you will serve to give some idea how inconvenient it is when the young oysters deform themselves by crowding and clinging to granite rock.

Take, on the other hand, this specimen of a collecting tile, the inner surface of which is covered with oysters, some of them of more than a year's growth. This tile I picked up myself in the imperial oyster-park of La Forêt, near Concarneau, a place remarkably well fitted for the cultivation of the oyster. It will be observed that the oysters here are much better as regards shapeliness, than those upon the granite stone. I cannot, however, find a better way of enlightening you as to the application of these tiles than by reading to you the specification which Dr. Kemmerer, of the Ile de Ré (the oyster cultivator who seems to have had this branch of the subject under his special charge) has lately registered in our patent office. This specification contains, moreover, in a very succinct form, much valuable information as to the working of oyster parks.

"Oyster spawn, on its injection from the parent oyster, swims or floats in the sea, and is only preserved from destruction by meeting with some body or bodies to which it can adhere. "Cultch" is the term in use for such bodies. As soon as it attaches itself to any surface, or is of a size to be readily seen by the naked eye, oyster spawn is distinguished by the name of "spat." In the course of time the spat increases in size, and, passing through its intermediate stages, becomes oysters. But in order to acquire the characters preferred by consumers it must be detached from the bodies to which it has adhered when still young, and placed on beds or layings known to possess fattening properties. When left to nature, however, young oysters are found spontaneously to grow on the cultch to which they are fixed.

"My invention consists of contrivances calculated to meet these requirements, to which I give the name of oyster spat collectors. For this purpose I employ, by preference, tiles of the form of the ridge-tiles in use for roofing purposes, and made of common potter's clay or other suitable materials. The dimensions which answer best are a breadth of seven or nine inches, with a length somewhat exceeding two or three diameters, as, for instance, 24 inches long by 9 broad. I recommend the above form and sizes as being calculated to afford a good lodgment for the young oysters, and as being convenient to handle and arrange compactly and solidly in groups, but do not confine myself to such, any other size or shape being capable of securing, to some extent, the object in view. Although tiles are perhaps the best materials that can be used for oyster spat collectors, I do not limit myself to them, but in certain circumstances employ stones, bricks, slates earthenware, cement, "compo," glass, metal, wood, papier maché, wicker-work, felt matting, rope, cork, or other material to which can be applied the facing or lining specified in the following description, which is made specially applicable to concave tiles, as being the type and most perfect form of my collectors.

"Having reduced some common clay to the consistence of thick cream, by working it up with water, I coat, by means of a brush or otherwise, the hollow surface of the tiles to be used with this mixture, leaving untouched a small margin on each side or at the corners. I then prepare, in quantity sufficient to be all worked off at one time before setting, a cement capable of resisting the action of the water when submerged by the sea, such, for instance, as Portland cement, which, by experience, I have found to be the best for the purpose. Upon the prepared surface of the tile I throw a trowelful of cement, and with the help of a wooden or other mould of the same curve as the tile, and filling its concave side, spread it rapidly over the surface as as to form a facing or lining of $\frac{1}{8}$ to $\frac{1}{4}$ of an inch, or thereabout, in thickness. The free margins of the tile permit the layer of cement to attach itself firmly to it, while in the central portion the interposed coating of clay, by preventing adhesion, causes it to be easily detached.

"At or just before the period of the year when oysters begin to spawn, I place the collectors so prepared in situations chosen for the operation of collecting oyster spat, and where, if necessary, parent oysters have been previously laid, depositing the latter under or among them or in their immediate vicinity. When the foreshore is the situation selected, the part which gives the best result, the ground being of the right sort, is that which lies between low water of neap and that of spring tides.

"Previously to the time of year when frost is to be feared, the collectors, unless so situated as never to be entirely uncovered with water nor subject to 'freshes,' must be removed and treated according to the nature of the layings prepared for the future growth of the oyster brood. They may either be placed during the winter entire with their adherent crop of spat in suitable layings, or else the spat may be detached and transferred separately to the layings. If not undertaken before the setting in of winter, the latter operation must be performed subsequently. A very favourable time is when the young are about fourteen or fifteen months old. At whatever period it is done, all that is required is to remove the cement facing, and then to break it in pieces, according to the number of young present. Where but little spat has adhered to the collectors it will be found an economy, instead of detaching the entire facing, merely to gouge off what there is, and the following year to refresh the surface by means of a coat of thin cement applied with a brush."

In an interesting pamphlet, which he has written upon this subject, entitled "Des Ruches Tuilées et de la Culture des Huitres, sous le Rapport Commercial," Dr. Kemmerer recommends the admixture of defibrinated blood with the cement with which the tiles are to be coated. As this is chiefly albumen, I imagine that this was adopted in the expectation of attracting the young oysters to the spot, by offering them food already provided in their place of lodgment—an expectation which gave them the credit for being able to exercise a power of selection. As I observe, however, that he has not mentioned the defibrinated blood in this specification, I may fairly assume that he has discarded it as useless. It will be observed also that Dr. Kemmerer makes use of papier maché, among other materials; and in his pamphlet he recommends the employment of hydraulic limes, and cements of peculiar manufacture, not easily to be obtained in this country. In dealing with these, however, the British oyster cultivator will do well to consider, not the exact letter of Dr. Kemmerer's directions, but their spirit. Let him consider what he has to do. He has to provide an apparatus which can be obtained in large quantities and at small cost; something which can be easily carried about and arranged in the manner best suited to the peculiarities of the shore, and will yet resist the action of the waves, both by its weight and durability; something, moreover, which will present rough surfaces of adhesion to the young spawn, and yet allow the growing oyster to be easily detached without injury to the shell; something that will keep the oyster from the mud, and admit of the free passage of the ebbing and flowing water along the surface of the shore. The apparatus which best unites all these qualifications is, as far as I am at present aware, the collecting tile; but it is for every cultivator to judge for himself; and if he can

employ means which present all these advantages as fully as the collecting tile, there can be no reason why he should not employ them. Dr. Kemmerer is constantly improving the tile. In fact, to quote the words of M. le Docteur Gerbe, an able assistant of M. Coste in his patriotic labours, and whom I had the pleasure of meeting at Concarneau, "We have to seek and seek; the best mode of collecting the spat has yet to be discovered."

You will have observed that Dr. Kemmerer advises that the hollow side of the tile should be coated with cement, and, generally speaking, it is to that side that the oysters attach themselves. The little streams and currents into which the tide is broken by the irregularities of the shore, carry the spat about, and if the tiles be resting upon their edges, these currents flow under the hollow parts and deposit the spawn upon the inner surface. In communities of oysters there are, however, nearly as many instances of eccentricity as among communities of mankind, and it occasionally happens that the upper and not the under surface is chosen. Here is a remarkably fine and crowded example of this, which was picked up among the oyster parks of the Ile de Ré by Mr. Mitchell, the secretary of the Fish and Oyster Breeding Company, and kindly presented by him to me.

In quitting this branch of the subject, I would call attention to the bearing which this method of promoting the reproduction of oysters upon the shores is likely to have upon the condition of the deep-sea beds. It seems clear that the gradual disappearance of the oysters of late years is due to impoverishment of the natural beds by over-dredging. Captain de Saumarez, of her Majesty's steamer *Dasher*, told me that a few years ago, when surveying between Jersey, Alderney, and the Coast of France, he came upon a large bed of natural oysters lying in the bottom of the Channel, more than three miles in length, and of considerable breadth. The news soon spread, and in a very short time (such was the rapacity of the oyster-dredgers) not an oyster was left to tell the tale. Now, it is likely that by establishing oyster-breeding in all available parts of the foreshores, the quantity of spawn will become so enormous that the deep-sea beds will be benefited by it. The perils which an individual embryo must be exposed to in its journey from the coast to "full fathom five" at the bottom of the Channel, must, of course, be formidable and numerous; but when we recollect that each mother-oyster throws forth such embryos by millions, it can scarcely be that so much spawn can be produced without vast quantities being carried away by the water and deposited safely at the bottom of the sea. This, indeed, is the opinion of M. Coste, who points to the alienation of the foreshores for this purpose as the most certain means of renovating the deep-sea beds.

It is highly probable that these artificial methods of propromoting the propagation and protecting the spawn might be applied with effect to other shell-fish than oysters. Whilst I was writing this paper I received a letter from the Right Hon. Edward Cardwell, Her Majesty's Secretary of State for the Colonies, to the effect that the Pearl Fishery at Ceylon had entirely failed this year, and asking for information that might be of service to the Ceylon government as to the cultivation or preservation of the pearl oyster. Now I need not tell most of you that the pearl oyster is not an oyster at all. It belongs to the order *Aviculidæ*, and is one of the wing-shells. It throws out a byssus, like the mussel, whereby it attaches itself to other shells or stones. The letter of Mr. Cardwell was accompanied by a copy of a despatch from Acting-Governor O'Brien to the Duke of Newcastle, stating full particulars of the surveys made and the observations taken. I cannot, of course, detail them here. I may mention, however, that the circumstances were sufficiently desperate to warrant the Ceylonese government in putting a stop to all preparations for the fishery; and the acting-governor adds that he is afraid "that there is no prospect of a fishery for some years." Now, it would be very presumptuous in me to offer any very decided opinion as to the cause of the failure of the Ceylon fishery, in the face of the fact that these suspensions and failures of the fishery have occurred before, and have occupied the serious attention of eminent and intelligent men, who have enjoyed ample opportunities of investigation without coming to any certain conclusion as to the cause of the mischief; but on reviewing the circumstances of the case as described in the acting-governor's despatch, it appeared to me probable that the calamity was due, not to one cause only, but to a combination of causes, and that here was a case where the artificial processes of the oyster-cultivators might be applied almost with the certainty of success. Mr. Mitchell (who has studied this subject of oyster-culture to as good effect as any man in this country) entirely agrees with me in this, and feels certain that, without in any way encroaching on the ancient pearl-oyster banks, the multiplication of the bivalve that produces the pearl might be secured in Ceylon if the Government would grant the use of the foreshore, in certain parts of the island, for the establishment of artificial beds in which the principles of marine pisciculture could be effectually applied. The pearl-oyster (or rather mussel) is a shell-fish, which is able to exist and thrive on ebb-dry foreshores, and its means of attaching itself to the soil are such as to render it easier of control than the edible oyster. If an experiment of this kind were successful, the artificial system of cultivation might afford the means of introducing the pearl-oyster to many parts of India besides where it is at present found.

After Mr. Mitchell and myself had come to this opinion, it struck me that I should do well to turn to Sir Emerson Tennent's valuable work on the "Natural History of Ceylon," and on doing so, I find that he recommends precisely the same remedy. Sir Emerson Tennent gives a most interesting account of the pearl fishery and of what was known and surmised as to the cause of its occasional failure. He says:—

"A trade more ancient by far than that carried on in chanks, and infinitely more renowned, is the fishery of pearls on the west coast of Ceylon, bordering the Gulf of Manaar. No scene in Ceylon presents so dreary an aspect as the long sweep of desolate shore to which, from time immemorial, adventurers have resorted from the uttermost ends of the earth in search of the precious pearls for which this gulf is renowned. On approaching it from sea the only perceptible landmark is a building erected by Lord Guildford, as a temporary residence for the Governor, and known by the name of the "Doric," from the style of its architecture. A few cocoa-nut palms appear next above the low sandy beach, and presently are discovered the scattered houses which form the villages of Aripo and Condatchy.

"Between these two places, or rather between the Kalaar and Arrive river, the shore is raised to a height of many feet, by enormous mounds of shells, the accumulations of ages, the millions of oysters, robbed of their pearls, having been year after year flung into heaps, that extend for a distance of many miles.

"During the progress of a pearl-fishery, this singular and dreary expanse becomes suddenly enlivened by the crowds who congregate from distant parts of India; a town is improvised by the construction of temporary dwellings, huts of timber and cajans, with tents of palm leaves or canvas; and bazaars spring up, to feed the multitude on land, as well as the seamen and divers in the fleets of boats that cover the bay.

"I visited the pearl banks officially in 1848, in company with Capt. Steuart, the official inspector. My immediate object was to inquire into the causes of the suspension of the fisheries, and to ascertain the probability of reviving a source of revenue, the gross receipts from which had failed for several years to defray the cost of conservancy. In fact, between 1837 and 1854, the pearl banks were an annual charge, instead of producing an annual income, to the colony. The conjecture, hastily

adopted, to account for the disappearance of mature shells, had reference to mechanical causes; the received hypothesis being that the young broods had been swept off their accustomed feeding grounds, by the establishment of unusual currents, occasioned by deepening the narrow passage between Ceylon and India at Paumbam. It was also suggested, that a previous Governor, in his eagerness to replenish the colonial treasury, had so "scraped" and impoverished the beds as to exterminate the oysters. To me, neither of these suppositions appeared worthy of acceptance; for in the frequent disruptions of Adam's Bridge, there was ample evidence that the currents in the Gulf of Manaar had been changed at former times without destroying the pearl beds; and moreover the oysters had disappeared on many former occasions, without any imputation of improper management on the part of the conservators; and returned after much longer intervals of absence than that which fell under my notice, and which was then creating serious apprehension in the colony.

"A similar interruption had been experienced between 1820 and 1828: the Dutch had had no fishing for twenty-seven years, from 1768 till 1796; and they had been equally successful from 1732 till 1746. The Arabs were well acquainted with similar vicissitudes, and Albyrouni (a contemporary of Avicenna), who served under Mahmoud of Ghuznee, and wrote in the eleventh century, says that the pearl fishery, which existed in the Gulf of Serendib, had become exhausted in his time, simultaneously with the appearance of a fishery at Sofala, in the country of the Zends, where pearls were unknown before; and hence, he says, arose the conjecture that the pearl oyster of Serendib had migrated to Sofala.

"It appeared to me that the explanation of the phenomenon was to be sought, not merely in external causes, but also in the instincts and faculties of the animals themselves, and, on my return to Colombo, I ventured to renew a recommendation which had been made years before, that a scientific inspector should be appointed to study the habits and the natural history of the pearl-oyster, and that his investigations should be facilitated by the means at the disposal of the Government.

"Dr. Kelaart was appointed to this office, by Sir H. G. Ward, in 1857, and his researches speedily developed results of great interest. In opposition to the received opinion that the pearl-oyster is incapable of voluntary movement, and unable of itself to quit the place to which it is originally attached, he demonstrated, not only that it possesses locomotive powers, but also that their exercise is indispensable to its economy when obliged to search for food, or compelled to escape from local impurities. He showed that, for this purpose, it can sever its byssus, and re-form it at pleasure, so as to migrate and moor itself in favourable situations. The establishment of this important fact may tend to solve the mystery of the occasional disappearance of the oyster; and if coupled with the further discovery that it is susceptible of translation from place to place, and even from salt to brackish water, it seems reasonable to expect that beds may be formed with advantage in positions suitable for its growth and protection. Thus, like the edible oyster of our own shores, the pearl-oyster may be brought within the domain of pisciculture, and banks may be created in suitable places, just as the southern shores of France are now being colonised with oysters, under the direction of M. Coste. The operation of sowing the sea with pearl, should the experiment succeed, would be as gorgeous in reality as it is grand in conception; and the wealth of Ceylon, in her 'treasures of the deep,' might eclipse the renown of her gems when she merited the title of the 'Island of Rubies.'"

How far the conclusions of Dr. Kelaart, as to the migratory powers of the pearl oyster, are accurate, I cannot tell; but I am rejoiced to find the opinion of so careful an observer as Sir Emerson Tennent, as to the applicability of oyster-culture to the renovation of this important fishery tally so exactly with my own.

Little remains for me to do but to lay before you a few considerations, as to the practicability of applying the processes of the French cultivators to the renovation of our own oyster fisheries, and of thus rendering this delicious and popular article of food more plentiful, and conquently cheaper, than it ever was. Of course we shall have plenty of objections started. A keen observer of human nature, who has had great experience of mankind, and has seen "men in nations," has declared that whereas it is the faculty of the oriental mind to consider a proposition newly put before it, with the view to discover what of good there is in it, it is the faculty of the occidental mind to object. Now objections on the part of those who are in possession of the oyster-fisheries which already exist may be expected; it is in the nature of things that these should prefer to keep their business to themselves rather than see it thrown open. These will tell us that it is only in certain localities and amid certain conditions that the native oyster can attain its much-prized perfection of plumpness. That is very possibly so; but I believe those localities to be much more numerous than those which are now used for the purpose of oyster-culture. It is is even possible that there are some spots where the conditions necessary to perfection exist in so happy and special a manner that the oyster may attain in them a degree of excellence not attainable in other less fortunate places. What then? Is it not exactly the same with the grape vine? And is the multitude, who can only afford pence for its luxuries, to be debarred from good sound *ordinaire*, because the wealthy can sip Clos de Vougeot and the Prince Metternich's Cabinet at the cost of pounds? In illustration of the peculiar circumstances which may affect the condition of oysters, I may mention that the excellence of the Pandore oysters, so prized by the Edinburgh *gourmets*, is attributed to the refuse of the Preston-pans breweries, which finds its way into the sea near their layings.

But a still more dangerous class of objectors are those who, in scientific garb, start objections which are not supported by the truths of science. Since propositions have been afoot for applying the processes of the French oyster cultivators to the enrichment of our foreshores, much has been said about frost and the Gulf-stream, and it has been objected that although these processes may do very well in the Bay of Biscay, where there is no frost and where there is the Gulf-stream, they may not answer so well here where the conditions are reversed. Now, in reply to this, I have to say that there is frost in the Bay of Biscay, and that the effect of the Gulf-stream is no more appreciable there than it is upon our own coasts, especially the coast of Ireland. Whether there is such a thing as the Gulf-stream at all, whether it is possible for a stream of hot water to find its way across the wide Atlantic, preserving throughout the journey its individuality amid the colder ocean through which it flows, is a question I must leave to the decision of abler men than myself, but at any rate those who believe in the existence of this stream have always given the shores of Ireland credit for participating in its benefits quite as much as any other part of Europe, and I have had the satisfaction of hearing Mr. Ffennell, the Government Commissioner of Fisheries, express his conviction that the processes of oyster culture will succeed in England, and that they could not fail to be in the highest degree beneficial if applied upon the Irish coast; for he knew of miles upon miles of shore which might be converted from literally desert sands into fields of smiling plenty. I also am convinced that on the shores of England, and especially in the mouths of our great rivers, and on the east coast northward from the mouth of the Thames, there are large tracts which only require enterprise and capital to become manufactories of food and nurseries of wealth.

Already, several enterprises of this kind have been undertaken. With the view of putting to the test of actual trial the French system of artificial oyster culture, the "Fish and Oyster Breeding Company" have acquired the use of a portion of the oyster layings belonging to Mr. Scratton,

of Prittlewell, which are situated on the foreshore to the west of the pier at Southend. Here they have laid down about 1,500 bushels of full-grown oysters, which have been spread over about five acres of space, in such a way as to leave room for the placing of 50,000 of Kemmerer's collectors, which are at the present time being prepared under his patent. If each collector on an average catches but ten spats, the crop secured in one year will amount to 500,000 oysters, the value of which will be £1,000.

Having made arrangements with an adjoining proprietor for the use of a series of fish pits, originally constructed as vivaria for the keeping alive of flat fish for market previously to the construction of railroads, and containing each about 400 superficial surface of water, this company intend setting apart some of them for experiments in the rearing of oysters in *claires*, on the system so successfully produced on the west coast of France, and devoting others to experiments with young salmon, whitebait, flat fish, and eels, all of which, there is reason to think, can with profit be grown for sale in confinement. They thus hope not only to have immediately in working order an establishment situate within an easy distance of London, calculated to form a centre of practical information on the subject of marine pisciculture, but to be able to demonstrate the profitable nature of such undertakings by the division of respectable dividends.

This undertaking if properly carried out (as I have little doubt it will be under the able superintendence of Mr. Mitchell), can scarcely fail of success. There is also another company about to begin operations at Herne Bay, in which my coadjutor, Mr. Buckland, is interested, a circumstance which of itself is a warrant of success.

Into the legal branch of the question I do not propose to enter very deeply. I am aware that there are legal difficulties in the way of oyster-culture not inconsiderable, but difficulties in the way of a laudable enterprise are only incentives to work harder in bringing it about. The right of the crown to the foreshores is an ancient one, and it is necessary to the proper defence of our seaboard. I have no doubt, however, that in all localities proper for their cultivation, and upon good reason being shown, the crown would be advised to cede that right under limitations, and Parliament may be induced to give a right of private property to oyster cultivators in the parks which they construct, and all contained in them. The greater part, if not all the oyster fisheries which at present exist upon our coasts, have their rights founded upon royal charters. It is worthy of notice that in the little island of Guernsey the same difficulties existed, but they are nearly if not quite overcome. Three years ago, visiting that interesting and beautiful ocean gem, I noticed in some of the bays which skirt the island what appeared to me to be a particular aptitude for oyster cultivation. Some gentlemen of the island to whom I spoke about the matter determined to take the idea up and work it to profit, and they have since been organising their plans. It was found, however, that before they could set to work they must obtain the consent of the Queen, who claimed the foreshores, not as Queen of England, but as Duchess of Normandy; and that they must then go to the States of the island, and ask them to make such an alteration in the laws of the island as would make it a larceny for anyone to steal oysters from a park laid out upon what has hitherto been considered open shore. These were formidable difficulties to overcome, especially the last; but that they have been overcome I have good warrant, for only the other day I received a letter, dated the 25th of April, from Dr. Hoskins (a Fellow of the Royal Society, an eminent meteorologist, who has for nearly a quarter of a century recorded and digested the meteorological phenomena of the Channel, the honorary secretary of the Acclimatisation Society of Guernsey, and my very good friend), in which he says:—"You will be glad to hear that oyster-culture is being taken up very earnestly by our people, and that several companies are already formed, and have obtained grants of beach in some of the bays." I am very glad indeed to hear it, for (unless I am very much mistaken) I perceive in this movement the germ of prosperity in the future, and I am in hopes of living to receive an annual barrel of Guernsey oysters, as a testimonial, for having been fortunate enough to be the first to point out the capabilities of the island.

It now becomes my pleasing duty to thank you very gratefully for having listened to what I have had to say. Much that I have told you is taken from other and abler observers, but if I have had it in my power to add anything from my own opportunities of observation to what they have recorded, it is an achievement of which I shall always have reason to be proud. It may be an old art (as I commenced by stating), but in this country it is a new one, and I, for my part, shall feel amply repaid for any trouble I may have taken in the matter, by the sense that I have been instrumental in a movement so fraught with benefit to my fellow-creatures, and proud am I at being permitted to march in this great movement shoulder to shoulder with Coste, Kemmerer, Mitchell, and other zealous oyster-cultivators—not as generals of the army, but as pioneers. It was once said that that man who made two blades of grass grow where one grew before, deserved better of his country than the conqueror of armies. How much more will they deserve who grow food where none ever was before?

To cultivate the sea; to till and sow the shore like a corn-field; to cover the salt sand with rich and nutritious crops; this will be an achievement indeed! And that it is not an impossible one, the example of what has been done upon the French coast gives us sure and certain proof. Let us set about it.

As an incentive to this work, I will show you just one picture more. It is a view of the Bay of La Tremblade, in the Ile de Ré, the foreshore of which is covered with oyster-parks. The water is down, and allows us to see the walls of enclosure, and here are the poles driven into the shore, which show the lines of demarcation between the several properties. Some peasants are working at these parks, and here sits Dr. Kemmerer, the zealous oyster-cultivator, surveying, with an air of pleased satisfaction, the glorious scene of plenty which he and those who have worked with him have evoked as it were out of the desert. Who does not envy his feelings?

DISCUSSION.

Mr. Ffennell (Government Inspector of Fisheries) thought those who came forward to promote the cultivation of the oyster deserved the gratitude of the country. There was at present a great deficiency in the supply; there were, however, abundant means of producing large supplies, and it only required energy and knowledge to accomplish this work of great national importance. Mr. Lowe had referred to him, in his paper, as having stated that there were large portions of the coast in Ireland adapted to the cultivation of oysters. Of that there could be no doubt. It was not a mere matter of speculation, because on many occasions, by accident as it were, oysters had grown up where they were never known to grow before, and had those places been sought out and carefully cultivated, large supplies might have been obtained long ago. As an illustration of this, he would mention that there were now, and had been for many years, valuable oyster beds in the Cork river, a little higher up than the harbour; these had been established as a private property, and the origin of these beds was this:—A vessel freighted with oysters for the Cork market, having anchored in the river, was detained so long by the low tides that the oysters, which were supposed to have perished, were thrown overboard; but they were not quite dead, and from that circumstance there sprung up a very large supply. It was clear that many places might be found equally favourable for oyster-culture, where oysters might be bred. He regarded the movement made in this direction in this country as most laudable, and he regretted that opposition had been raised

by the public press to some of them. There was room enough for all, and there should be no jealousy about the matter. Even on that very day he had read in a newspaper something about depriving the poor people on the Kentish coast of their means of livelihood by taking possession of certain oyster grounds they enjoyed. There never was a more unfounded charge, because, in fact, the poor people alluded to had nothing to lose in that respect. The place had been denuded of oysters, and the re-stocking of those grounds by private enterprise would lead to a vast amount of employment being given to the poor which they could not obtain at present. It seemed that this movement, like most other new things, was subject to a foolish, and he must say, mischievous opposition; and he trusted every thinking person would aid in promoting projects like these, which were calculated to supply a large amount of food to the community, and thus to add to the wealth of the country, as well as afford employment to large numbers of people. There was one place in Ireland which, some years ago, gave employment to some 2,000 people in the culture and collection of oysters. The beds there were worked to such an extent that the mere freight in one week often amounted to £1,000; but so recklessly were the beds worked that their entire produce at the present time did not amount to £300 per annum. The beds were completely destroyed, and the few people who remained in their vicinity only obtained a miserable pittance out of them, and any person seeking to cultivate these grounds as private property, by means of which employment could be given to 2,000 or 3,000 people, would, in fact, be a public benefactor. He believed that no adequate progress could be made in this important movement unless power was given to parties who had the skill and enterprise to engage in this operation, to establish a private property in oyster beds.

Mr. FRANK BUCKLAND was sure they must all admire the earnest spirit in which Mr. Lowe had brought this subject before their notice. Not long ago he (Mr. Buckland) had the pleasure of stating, in this room, what was doing in the way of the artificial propagation of salmon and trout, whose spawn was counted by thousands, but the oyster yielded millions. He had begged them to take the trout and salmon in hand. Mr. Lowe asked them to do the same with regard to the oyster. Gentlemen present, engaged in the oyster trade, could testify to the amazingly prolific character of the oyster, and its cultivation promised to be highly profitable. This year, owing to the early arrival of hot weather, oysters had begun to spat earlier than usual. Generally they did not spat before the 9th of June, but this year the warmth of the weather, which was killing his young salmon fry, had occasioned the earlier spatting of oysters. The great point, as had been urged by Mr. Lowe this evening, was to preserve the oyster brood from being swallowed up by sandbanks, &c.; the young oyster only wanted something to stick to, and this was all we need supply him with. Looking to the comparatively small per-centage of brood that come to perfection, it was amazing that so long a time should have been allowed to elapse without some artificial means being adopted, founded upon nature's own laws, for the cultivation of an article of food, which was now supplied in very inadequate quantity, and at a greatly-enhanced and annually-increasing price. With regard to the pearl fishery, that was a different matter altogether. The pearl-oyster in Ceylon had been destroyed from a cause beyond the control of man. He had been informed on good authority that a peculiar kind of skate-fish had made an attack upon the pearl-oysters, and had nearly eaten them all up, and he believed that was the principal reason of the failure of the pearl-fisheries this year; but there was no reason why the pearl-oyster should not be cultivated in India, as he hoped to see done with the other species of bivalve in this country. The great thing to be considered in the cultivation of the oyster was temperature. With the thermometer at 70° salmon fry died, but oysters flourished. There were parts of the coast of England that were within the influence of the great Gulf-stream, and these were well adapted with regard to temperature for the breeding and cultivation of oysters. On the west coast and on some portions of the east coast there were places well adapted for the establishment of breeding and feeding grounds for oysters, but he did not expect to hear of oysters being cultivated on the coast of Northumberland. This might, however, be done on the west coast of Scotland, and even at no great distance from the mouth of the Thames: but he would impress upon them that the great thing in the breeding of oysters was high temperature. A low temperature was fatal to the oyster brood, and they died immediately. As nature had shown them what to do, why not elevate the temperature to suit the little oysters? They packed salmon eggs in ice to retard their development when sending them out to Australia: on the same principle, he said, they should apply heat to the oysters and make them spat.

Mr. MITCHELL said he represented a body of gentlemen who had taken great interest in this subject, and who, without appealing to the public, and without any Act of Parliament, expected in a few months to put this matter to the test. They had seen what had been done in this direction in France, and they hoped to do at least as well in this country. With Mr. Ashworth's salmon-hatching apparatus he expected better results in the cultivation of that fish than had been obtained in France, for though the idea of salmon-culture chiefly originated in that country, yet the practical carrying of it out had been much retarded there, but Mr. Ashworth had met with considerable success. He hoped to see good results arise from the operations in oyster-culture which had been commenced in the vicinity of Southend.

Mr. RIDLEY (of Ipswich) requested Mr. Lowe to favour him with some further particulars as to the formation of the oyster parks on the French coast. It appeared that the oysters were covered with water at high tide, and he should be glad to learn what was the average depth of water at extreme low tide, also what height the walls should be made, and further, whether Mr. Lowe had seen any attempts made to propagate oysters in enclosures of salt water by the side of a river. As one of those connected with the management of the river at Ipswich, he might mention some experiments in oyster-breeding that had been made in an enclosure of salt-water, originally constructed as a bathing-place, a short distance from the town of Ipswich, and 11 miles from the sea. The depth of the enclosure nearest the channel was 10 or 12 feet, and in the upper part about four feet. In the deepest part of this acre of salt water, they last year placed some oysters enclosed in wicker baskets, partly to protect them against depredation, and partly because, being in a sluice-way, it was thought the wicker work might form points of attachment for the young oysters instead of their being drifted away by the tide. The baskets which were deposited in the month of May were taken up in November, when it was found that a considerable amount of spat had become attached to the wicker-work; and, contrary to what had been stated as to the results with the tiles, the young oysters were for the most part attached to the upper-side of the basket, and also to piles driven in the sluice-way as a protection against the earth washing away. Scarcely an oyster was to be found on the underside of the baskets. It was in contemplation to form a larger oyster-park in the river nearer to Harwich-harbour in a natural bay, which appeared very favourably situated for oyster cultivation; and the object of his inquiry now was to ascertain what depth of water it was necessary to have over the oysters at low tide, and whether it was indispensable that the water should be changed with every tide. His present experience did not enable him to give an opinion on these points. He believed, in the pond at present in use that the water was changed on an average once in two or three days; and as

the breeding of oysters in an enclosure of that kind might be a new point to some present, he thought it his duty to bring it before the notice of the meeting.

Mr. Bishop mentioned that in the course of his travels he had seen an oyster lake similar to that described by the last speaker, and close to the shore. He noticed that planks of timber were placed in this enclosure, as he apprehended, for the young oysters to attach themselves to. The planks were kept in position by uprights, and worked in grooves to meet the rise and fall of the tide.

Mr. Thomas Ashworth remarked that the natural breeding ground of the oyster was upon rocks, and its natural feeding ground was in the mud; at the same time it must not be buried in the mud. It could only be bred on rocks, tiles, or other hard substances to which it could attach itself. It could not be bred on the upper side of the tile where there was half an inch of mud, or it would be smothered. On the grounds at the Ile de Ré, the tiles were placed in rows of six or seven in succession, the upper portion of the tiles being covered with a natural sediment deposited by the water, and it was only on the under side of the tiles that the young oysters were discovered. They were also bred on stones placed for the purpose, not arranged in the form of a wall, but overlapping each other, and it was on the under side of the stones that the oysters were principally bred. As far as the feeding and fattening ground was concerned, the important thing was to collect the young oysters from the tiles at a suitable period, and convey them to mud ponds or *claires*. Those ponds might be made of any convenient size. The walls were about two feet high, and were constructed of the soil obtained from the bed of the stream. With regard to the experiments at Ipswich, he did not think the plan would succeed in stagnant water, but that it required to be frequently changed. The spat would no doubt attach itself to every part of the basket which was not enveloped in the mud, and provided the tide was constantly running over it. There were salt ponds in the Ile de Ré, but they could not breed oysters in them, simply because there were no tiles or stones for the spat to attach itself to; these ponds were only suitable for feeding.

Mr. Tegetmeier mentioned, as a fact opposed to the theory of high temperature advanced by Mr. Buckland, that the whole of Switzerland received its supply of oysters from Frederikshavn, on the Cattegat, which was entirely removed from the influence of the Gulf stream, and was frozen over during the winter.

Mr. Buckland expressed himself delighted to reply to Mr. Tegetmeier, by showing him some specimens of North Sea oysters, which consisted of an immense quantity of shell and but little flesh, while the opposite qualities characterised the oysters from the more genial locality of Faversham.

The Chairman said it was now his duty to ask the meeting to acknowledge by a vote of thanks the very instructive paper with which Mr. Lowe had favoured them this evening.

The vote of thanks having been passed,

Mr. Lowe, in reply to Mr. Ridley, said, in dealing with so large a question it was impossible, within the limits of a single paper, to go into elaborate or minute details of each part of the operation. He might state that the walls in the parks were not intended to confine the water within them, but were only for the purposes of demarcation, and no artificial means were taken to confine the water. If any water remained over the oysters at low tide, it was only due to the configuration of the shore. With regard to the shallow-feeding ponds built on the upper part of the foreshore—the *claires*—the walls were made water-tight and about eighteen inches deep, and they retained the water over the oysters at low tide. As to the influence of the Gulf stream upon the temperature of this country, he was not presumptuous enough to deny the existence of that stream; he merely ventured to suggest that it was by some considered an open question. It had occurred to him that perhaps the beneficent effects of a mild temperature might be due to some other cause than this alleged large quantity of hot water called the Gulf stream; and when he found his own speculations borne out by the testimony of eminent practical men, he began to think there might be something in them.

The paper was illustrated by photographs, kindly shown in the magic lantern by Mr. Smith, representing:—1. Embryo oysters, magnified 140 times their natural size. 2. A piece of wood with oysters attached, of five different stages of growth, varying from 15 or 20 days to 12 or 14 months old. 3. Group of oysters attached to a piece of granite rock. 4. Group of oysters on a collecting tile. 5. Panoramic view of the Bay of La Tremblade, in the Ile de Ré, with oyster parks on the foreshores. On the table were specimens of various kinds of collecting apparatus—the plain and cemented tiles, shell tiles, faggot tiles, &c., also fine specimens of Colchester and Paglesham natives, Black Rocks, oysters from the North Sea, Prince Edward's Island, and of the pearl-bearing oyster.

Proceedings of Institutions.

Halifax Working Men's College.—The report, issued at Easter, being the end of the ninth year, says that looking at the classes as a whole, they have been well and regularly attended, and a very creditable amount of sterling hard work has been done, both by teachers and students. The committee offer their most hearty thanks to all who teach in the College, to whose unwearied exertions the whole success of the scheme must be assigned. There is one point with regard to the classes generally which the committee see with much regret, and that is, the large number passing through both Institutions in a single year, without remaining long enough to reap the benefits derived from them. During the past year, in the Working Men's College, including the Copley Branch, no fewer than 467 have been under instruction, with an average nightly attendance of 147, and a total on the books of 245. Taking the number of those now in the classes, who have attended regularly during the year, the fact is arrived at that considerably more than twice that number have passed through the College during the last 12 months. This shows how few proportionably possess the perseverance necessary to overcome the irksomeness of the first steps in the acquisition of knowledge. The same remarks apply to a great extent to the Young Women's Institute. Including the Copley Branch, 244 have been under instruction, while there are on the books 114, with an average nightly attendance of 80. Home requirements, however, interfere much with the regular attendance of the young women, as does also the call for extra labour with that of the young men. Seasons of great prosperity in manufacturing districts, by compelling in many cases extra hours of work, tell more against the success of working men's colleges than does a period of comparative dulness in trade. The success of the theological class has been great. The English literature class commenced with six young men, but for various reasons they have all been compelled to cease their attendance. The bookkeeping class still maintains its popularity and prestige. The French and singing classes are at present in abeyance. During the past year a class in political economy has been commenced. This is a subject which the committee most strongly recommend to the notice of working men as being likely to give them correct ideas concerning the common affairs of life. The science classes are still much too small for the credit of the district. In the Young Women's Institute a considerable number of the older pupils who had previously left have returned, and are now pursuing their studies most satisfactorily. A competitive examination on a

small scale has been held this year, consisting of papers on history, geography, arithmetic, and domestic economy. Out of 77 female students, 69 voluntarily took these papers, and with the best results. The Copley Branches, both of the Working Men's College and Young Women's Institute, are going on well.

ART WORKMANSHIP PRIZES.

Our correspondent on this subject thus concludes his remarks:—

At the end of my third communication, published on the 14th instant, something was said on the history and probable origin of the famous bust styled "Clytie." It may not be unadvisable—with a view to future selections of models, not only for the class in question, *i.e.*, of chasing in bronze, &c., but for those allied to it, such as die-sinking, cameo-cutting, and the like—to offer a few remarks on the great superiority of the current and above-named model to that selected last year for the same class. I hope to make these remarks less particular than general, and intend to use the past example as the representative of a certain development of art, which it expresses in a happy and fortunate manner. My object is to state convictions of the value and, indeed, inexpressible importance of attending to nobility of style in choosing not less than in reproducing models for uses such as we now entertain.

The example preferred last year was the head and bust of a statue of "Psyche," by Mr. Gibson, a Royal Academician and sculptor, known, by his life-long endeavours to reintroduce—or it may be said to revive—the spirit and manner of antique sculptural art in this the nineteenth century. Apart from obvious objections to the use, on an occasion of this sort, of a work by a living artist, there is the less patent one—the force of which none will admit more freely than Mr. Gibson himself—that his production is not in any respect equal to the antique of which it is plainly a revival. In a series of works intended for translation, the value of which is derived above all things from perfection of style, there is a palpable objection to the use of examples which are attempted translations of methods of treatment and execution, as well as resuscitations of the informing spirit, of a long by-gone school, which worked and was moved by influences that are strange to us, and, above all, which addressed minds prepared to give the reception of faith to its productions, and had associations such as not even scholastic training can make live again. It is surely not desirable on the part of our art workmen to produce translations of translations, and it is least so when the example placed before them is not in itself peculiarly adapted to the tone of modern feeling. It is not in these days wise to attempt to revive antique methods of execution and phases of thought.

It would occupy too much of my space here to discuss the influence of moral and religious convictions, or even habits, on every branch of art; suffice it, that the Pagan and the Christian developments of design are separated by the width of a world of intellect, and that it is demonstrable how in no one sense are they identical. This is universally admitted, yet we find men devoting themselves not so much to the production of original works, as of such as they believe capable of producing impressions upon the minds of their contemporaries, similar to those wrought upon Greeks or Romans by the great sculptors of antiquity. This is exceedingly strange. It testifies powerfully to the admiration some of our best-known sculptors entertain for the prime examples of their art; it confesses want of confidence in their native powers, and, so far, to their own humility. Persistency in this matter has had, it would appear, fatal effects upon not alone the popular, but the real value of sculptural art in these days. There is something unreal about modern sculptures, wrought, as they mostly are, in the influence of the superstition, if I may so style it, above defined. Sculptors produce Venuses, Apollos, Dianas, and the like, but they cannot ever hope to get them received with the ardour of ancient times. Psyche is a nonentity to us; her very legend is comparatively little known; Venus is to most men but a naked statue; and Apollo needs the fire of Homeric verse to warm us to feeling how—

> "—————————— his bow
> And quiver cover'd round, his hands did on his shoulders throw;
> And of the angry Deity the arrows as he mov'd
> Rattled about him."

One result of the falsehood of antique motives and themes in modern sculptural art is the indifference of the public to its productions; the cold, unsympathising shadow of neglect lies upon them; and their purchasers are not so much of the highly-educated class as those upon whom scholastic influences have the greatest power. It is not a paradox to say that a learned man is not necessarily a highly-educated one. Modern sculpture is not the art of the people; it loses half its honour, and all its usefulness, in failing to be so. The antique, mediæval, and the true Renaissance phases of sculptural art were emphatically expressions of the feelings of commonplace, not necessarily vulgar men. How a commonplace Greek or Roman felt with regard to the statue of a god we can but half surmise. Mediæval artists were almost invariably middle-class men, and it was to the people, and in churches, cathedrals, houses, public places, and the like, that their appeal was made. Governments that were more or less popular, such as the republics of Greece and Italy, the great commercial cities of Venice, those of France, Flanders, Germany, and Holland, fostered and developed art simply as a necessity of existence, and not by patronage or the expression of the aristocratic, scholastically-educated class. We know that art has more than once culminated under imperial rule; but we also know that its splendour was derived from foregone efforts, and that it has invariably corrupted when it ceased to be the expression of the nation at large. Antique mythology is no expression of the mind of the English nation.

If this is the case, and no one doubts it, why should we borrow motives for art from times whose convictions, still less whose feelings, we do not share? Still less is it, then, desirable to use translations of expressions of those feelings and convictions, as models for modern workmen. If the question of mere theme—as in the choice of Apollo, Psyche, &c., as subjects for art—could be separated from that of execution, and production in art had nothing to do with a man's own heartfelt convictions of the eternal value of what he is about—had nothing to do with design, then these points need not trouble us. As, however, these are paramount questions, and lie at the roots of art and honest work of every kind, it behoves us to take them into full account. Suppose a sculptor is called upon to commemorate as a hero a man whom in his soul he knows to be a knave, what sort of a heroic statue is he likely to produce? To complete the circle of the subject, let us say that in like manner, in its degree, to that of a man entrusted with the statue of a *pseudo*-hero, does Mr. Gibson produce a charming bust, executed in a *quasi*-antique manner, but with the hard leanness of modern surface and jejune carving—so objectionable in such a case as this—the uninspired features, and an action that expresses nothing of Psyche. If this work is not Psyche, what is it?

As to the use of modern sculptural art to supply models in such a case as the present, there is its admitted inferiority to ancient works to be still further impressed on the minds of my readers by one little point, strictly applicable to this case, which will affirm all I have said. It is that no student of art, who is worthy of the name, ever studies by way of drawing from modern antiques—to these there is visible a dividing ocean between the originals and the new versions. That we should choose perfect exemplars of style for such offices as that in view is obvious enough.

If we are to go to the antique, let it be really at first-hand. The Venus of Milo is the noblest theme for style among female antique statues. No two things can differ more utterly than does that glory of the Louvre from the modern Psyche. Style being, as I said at first, the main thing in question for art-workmanship, I should, if the antique be admissible, prefer, above all things, this Venus. If mere execution, devoid of noble style, be desired, as it may be, no finer or apter example exists than the "Clytie," which, being a portrait, is not obnoxious to the objections urged against the employment of mythologic subjects in such a case as the present.

As concerns the other examples to be reproduced in the round and in relief—of which I have not yet ventured to confess a personal but not hastily-obtained conviction—such as the piece of Goutier work, selected for the section of ornament in the class of chasing in bronze, and the models for those of cameo-cutting and die-sinking, I am bound to say that with regard to the last two, the sections of the human head, the objection above stated as applying to the use of work by a contemporary artist is apparently insurmountable. In their way these are beautiful works, but very far from being so suitable to the current purpose, either in style or execution, as antique gems, or some of the finest of the quattro and cinque-cento ornaments, medals, and coins.

With regard to the selection of models such as those before us, the question of style is so transcendantly important, and the productions of the antique and later centuries so greatly surpass all others, that I regret something was not chosen out of the inexhaustible stores of beauty and learning still remaining open to us, and of which the Kensington and British Museums possess splendid examples, such as those that are by, or have a close resemblance to, the work of Sperandio of Mantua, Pisanello, De Pastis, Boldu, Donatello, or A. Dürer. Sculptures of this order exist that are beyond praise; and, knowing what they are, we shall ever lament that Cellini did what he was told to do by Clement VII., *i.e.*, to unset the jewels, and "smash up" and melt the gold of the Papal tiaras, the sacredotal vessels and ornaments deposited in the castle of St. Angelo. If we are to believe Benvenuto, he did this to such an extent and so effectually as to obtain two hundred pounds weight of bullion, mere brute bullion, in place of all that inestimable beauty which the genius and labour of scores of artists had imparted to its form. Ought Cellini to have done such a work as this?

That an example of Goutier work should have been selected for the purpose in question, or accepted as a work of art, all will lament who do not recognise anything beyond an exalted kind of upholstery in the prettiest, the most laboured, or the most fortunately imitative productions of that ingenious Frenchman. All that is intellectual and artistic is absent from productions of the class to which we are accustomed to give his name, much beloved as it is by cabinet makers and desired by upholsterers. There is in the mere finish and the want of meaning of this debased order of decoration much that is most enjoyed, because most readily understood, by the ignorant and uncritical. Artists refuse to admit that anything like style exists in the productions in question. To possess the characteristics of a style, objects must be rich in meaning and apt for special uses; as I said before, the arabesques that are common to all materials are vulgar; they possess no style, no significance, consequently we cannot recognise in them the intellectual capacity of their producers. It is this capacity that delights us in works of art; mere labour, especially when applied to other than strictly serviceable ends, satisfies us not. We tolerate, indeed admire, though we do not enjoy, labour applied to such things as chairs and tables, *per se*, and admit the honesty of the painstaking maker, blaming him not for ignorance of art. But, if laborious decoration is applied to them, all satisfaction ceases, because of the obvious painfulness, or, worse still, the heartlessness it has. I may add that the piece of Goutier work selected for chasing in metal, looks as insignificant as it can look; knocked off a "piece of furniture," it might be stuck on any other "piece" without the slightest loss to itself or gain to its recipient. The article whence it was copied would probably look not much the worse if the original were knocked off. This sort of divorce is fatal in good art. As to any appearance of facile accomplishment possessed by the object in question, it has none; it looks as if it had taken a hundred times as long to make as did the piece of chiselled iron work referred to in my last. I spoke of this beautiful iron arabesque as being of German origin; this may be the place to say that, after close inspection, I believe it to be French.

While referring to the importance of style, I cannot refrain from saying how much more valuable the new example chosen for the class of embroidering appears to me than that which accompanies it, and was adopted last year. In the latter—a sort of purse, or *Gypsire*, of German workmanship and design, and dating from the end of the sixteenth century—the border is truly beautiful; it consists of a pair of monsters, placed face to face at the foot, and whose tails form scrolls of rich character on the circumference of the object, and terminate in a pair of grotesque heads of not very valuable but receivable character. It is to the naturalistic or imitative style of the body of this work that I object; this bears, wrought upon it with a needle, a representation, in *pseudo* relief, of horns filled with flowers, baskets, &c. Now, as in most examples of modern Berlin wool-work, there has been neither art nor acquired knowledge exercised in the execution, any more than there was in the design of these horns and their accompaniments, it required no particular knowledge of the subject, nor any invention, to conceive two horns such as these, springing from the base of a basket, and curving out to fit the form of the purse. To represent them in relief was a woeful mistake, and attempting something wholly beyond the province of needlework. The attempt was almost worthy of poor Miss Linwood, an otherwise estimable person, whose exhibition of copies from pictures were the delight of our grandmothers, who, good and happy souls, were innocent of the true nature and limits of art. Doubtless, no one would have gone to see a set of mere pictures, painted in the ordinary manner by Miss Linwood, any more than folks would crowd to a collection of figures of murderers, royal personages, and the like, at Madame Tussaud's, if that ingenious female produced them in mere black and white. The attraction was, in the former case, that the needle did the office of the painting brush—which it certainly ought not to have assumed; and in the latter and current case, that the wax-work show produces things which the vulgar think are "so very like life"—which they certainly ought not to attempt to imitate—at any rate, not in the tawdry and unskilful manner they adopt. It is hard to say, having before us the spendour of art in some Florentine terra-cotta busts, wherein life was imitated to a hair, as may be seen in the North Court at the Kensington Museum—how far imitation is acceptable in portraiture, but it is certain that the skill must be supreme to make it endurable. Not so supreme is it in the wax-works, nor the flowers in our piece of embroidery. The Italian example of embroidery, which has this year been added to the German purse, is not only a beautiful piece of workmanship, and so eminently suited to the purpose in view, but the form and character of its design are perfectly apt to needlework. Here is an instance of the importance of considering the nature of the material to which decoration is applied. The arabesque of the needle will not do for the arabesque of iron, or wood, or stone, or gold, but it may be less unsuitable to that which is proper to painting *per se*, and come short only in so far as the needle comes short of the painting brush. Of course that "makes all the difference."

I am now brought to the consideration of the arabesques painted on the picture-frame adopted as the model for the second section (*b*), in Class 9, Decorative Painting.

This is a beautiful work, and is, in the architectural character of its form, perfectly beyond challenge; even now, although the colour has greatly faded, one can trace signs of its former splendour in that respect. Its decorative architectural character is, however, in many parts simulated and exaggerated. It is hard to imagine why the designer—when he arranged with such skill the proportions of the base, with its *dado* and plinths, that of the pilasters which form the sides, and the architrave with its frieze and bold cornice—consented to paint the dentils placed between the cornice and the frieze of his work, instead of allowing them to be solid facts, as he might well have done. The cost of doing this would have been minute and, I think, the effect better. All the ornaments, whether arabesques, gulloches, key-frets, waves, acanthi, the many forms of egg and tongue mouldings, &c., are combined with exquisite art, and had they been treated as honestly painted forms, and in the flat, however much enriched by duplication of outline, they would be perfect. As usual, the attempt to imitate sculptural relief by painting defeats itself. A carved frame so richly wrought as this one, but in a legitimate manner, would be splendid. As all its elements are those proper to relief, and none but the general architectural forms appear in the solid, it is probable that the former, as well as the latter, have been borrowed from an earlier work. Examples of such are not uncommon in great picture galleries; one or two may be seen in the National Gallery. The model given for the first section (*a*) of the class of Decorative Painting, taken from an original in Castel R. Pandino, near Lodi, is an excellent one in most respects. While on the subject of arabesques applied to frames, I may as well correct a slip of the pen concerning the date of the carved picture frame, which occurred in my second letter; I wrote 1550, the second 5 should have been an 0.

I do not remember to have met with a finer example of decoration applied to a material perfectly suitable to exhibit it, than that afforded by the leather cover of a jewel-casket proposed for the second section (*b*) of Class 17. It would be difficult to find a better arabesque than this one; but considered with regard to its office it is perfect, as shown by the broad and yet richly-formed masses, their flatness, so apt to use in leather-work, as not seeming to violate the peculiar sheet-like nature of the material, the dextrous introduction of the rayed form of ornament to the front of the article, and the tasteful, yet perfectly simple way in which the ends of the object have been decorated. The modern notion of decorating leather is to impress upon it elaborate forms, cutting them so deep that one feels how terribly heavy must have been the pressure to which the skin was subjected ere it took such a dint. One consequence of this sort of treatment is that the flexible and soft expression of leather is lost, its elasticity is parted with, and the observer feels that the material proper to such treatment was stubborn iron, indomitable brass, terra cotta that never had a sense, and wood the penetrable. The first example in the Class of Bookbinding and Leather-work (*a* 17) is a beautiful one, consisting of a book decorated with scrolls and inlays in the manner known as that of Count Grolier, dating probably about the first third of the 16th century. Few, if any, orders of decorative design have been so fortunate as those of the class in question; as a rule, Grolier work, and, with some exceptions, that of Maioli, which, in a general way, resembles it, leaves nothing to be desired. In this example the forms of the scrolls, their perfect adaptation to the space to be enriched, their simplicity, their flatness, and the manner in which the spurs and little cuspings appear united to the lines of the scrolls, no less than the beautiful proportions and outlines of the inlay-work, and the exquisite beauty of the back of the book, present a whole which is admirable.

My task ends with a few words on the subject of the model chosen for the class of Glass Blowing. In no branch of the applied arts have the English of our day made such rapid and satisfactory progress as in household glass manufacture. With much good fortune the advance has taken effect on useful objects, and we have obtained tumblers and wine-glasses such as Venetians or Florentines of old need not have been ashamed to use. The vulgar mistake of "cutting" glass is happily on the decline, and the legitimate appearance of the material, its soft and clear lustre, is displayed. The effect of this change upon the aspect of a tastefully-spread dinner table is remarkable, the flash, the restless glitter of the tortured glass, the scintillations as of a thousand sham jewels, have vanished, and the eye rests upon pure forms and pure materials. Prismatic effects are, of course, in some cases, legitimately obtainable, but they should never be seen under circumstances which call for the honest use of a material such as glass, cut in the form of a prism, with straight lines and angles, the look of hardness is given to it. Where flashy display, combined with cheapness, is desired, of course cut-glass retains its position. None but the best glass looks perfect when uncut, so that it often happens that the labour of cutting an inferior material does not raise the price of common articles to a level with that of the best. The ductility of glass, and its brilliancy, as well as its capacity for receiving colour, were never better illustrated than in the examples now in question. As we have succeeded so well in producing beautiful and serviceable objects of glass, it is time that its value in pure decorative qualities should be recognized. Possibly the offer of the Society of Arts of a prize in this class may lead to the introduction of models such as that before us, and utter banishment of the hideous French and "Hungarian" ornaments, so called, which are rife in this country. It will be a happy day when the last serpent of emerald green, the last ruby vase, the last begilded and enamelled trinket, and innumerable forms of tawdry trash are smashed, and their fragments swept into the great dust-hole.

Fine Arts.

MUSEE DE CLUNY.—This interesting collection is constantly receiving new and important acquisitions. The other day only there were exhibited for the first time two pictures in enamel, one representing Olympus, and the other Italian Comedy. At the back of one of these works is a printed paper, believed to be authentic, which describes the enamels as the work of Riaux, who is called "Enameller to his Majesty attached to the Court." A curious tablet in copper has also recently been purchased and added to the collection. It contains in three columns the names and trade marks of 146 goldsmiths of Rouen, and bears date 1408. Besides these and several curious old pictures, there has been added the Badelaire, a kind of sabre, or rather scimitar, which belonged to the Great Châtelet, whose arms are embossed on the hilt. This interesting relic was found during the demolitions that took place on what is now the Place du Châtelet, near the Hôtel-de-Ville.

FINE ART EXHIBITIONS IN THE FRENCH PROVINCES.—Exhibitions of pictures and sculpture are just opened at Nancy, Evreux, and Spa, and that of Mons is announced for the 22nd instant. Amongst the works which have attracted attention at the Bordeaux Exhibition are two pictures—"Cupid causing the Chase to be neglected" and "Hunting Day." It is to be regretted that not a single English name appears in the list of awards made by the jury of the present Paris exhibition.

SALES OF WORKS OF ART IN PARIS.—The advance of the season does not seem to have frightened amateurs from the auction room; every day has its sale of more or less importance, and the prices obtained are remarkably high. At the sale of the collection Piot the other day, a small plate, or tazza, called *cuppa amatoria*, with a blue

ground decorated with enamelled arabesques in white, and bearing a shield with the arms of Medicis and Baglioni united, with another of a similar kind, fetched £32. A plateau, representing female figures posed in a zodiac, after Raphael, engraved by Marc Antoine, the work of Dureta, fetched £16 8s. A small hemispherical cup, with ruby coloured and golden reflections, the work of Gubbio, £16. A covered caudle cup, by Urbino, decorated on the outside with landscapes, in the interior with a subject of nurses and children, and bearing on the cover a figure of a lady reclining and receiving visitors, £20 4s. A small tazza by the same, ornamented with a subject from the story of Pysche, £44 8s. A remarkably brilliant and beautiful Persian silk carpet, about seven feet by six, no less than £160. A child riding on a snail, by Tullio Lombardo, a statuette about 14 inches high, fetched £184. A fine vase of the fifteenth century, about a foot high, £197. A cup on a high foot, decorated with coats of arms of the patrician family of Venier of Venice, supported by genii, about 12 inches high and of nearly the same diameter, £122. A terra-cotta group, by Donatello, the Virgin adoring the Infant Jesus, £100; this bas-relief is surrounded by an architectural arrangement, the pilasters being surmounted by a Corinthian pediment, in wood, carved and gilt, also supposed to have been the work of the same artist. Two recumbent figures in terra-cotta, by John of Bologna, after "Night and Meditation," by Michael Angelo, £70. Christ crowned with thorns, a bust, life-sized, in enamelled ware, by Lucca Della Robbia, from the gallery of the Marquis of Gerini, at Florence, £81. Bas-relief by the same, representing the Virgin seated, with the Infant on her knees extending his hand towards a lily, a small work, £120.

The Louvre.—The great changes which have taken place of late in the Museum of the Louvre have been completed, as far as regards the chief floor of that noble establishment, by the re-opening of the room known as the Salle des Séances, and in which the pictures of the battles of Alexander, by Lebrun, were for a long time exhibited. This room is now occupied by the Musée Napoleon III., which was displaced in consequence of the re-arrangements rendered necessary by the accession of the Campana and Sauvogeot collections. The walls are painted red, of a tint somewhat darker than that of Pompeii, and this serves as an admirable background for the objects set up near it. Large glass cases occupy a portion of the wall-space, and in the centre of the room are three well-arranged stands. These latter are covered with a collection of large Etruscan vases of the oldest period, and with Etruscan sarcophagi of various periods, some surmounted by figures of the deceased, and others decorated with rich sculpture in bas-relief. In the glass cases are—large bas-reliefs which served as friezes and metopes in various temples and tombs; fine vases of Canossa, with figures in cameo; a vase from Cuma, with cupids and flowers in relief, painted and gilt; a collection of terra-cottas of Ardea and Cyrenaica, already well known to connoisseurs visiting the Louvre. Four grand candelabra, two of which are in marble, and two in bronze, fill up the intercolumnar spaces at the ends of the room. The fine bronze reproduction of the *Victoire*, of Brescia, occupies a conspicuous place. There not being space enough in the glass cases in the Salle des Séances for the whole of the terra-cottas, the rest are now being placed in the adjoining room with the beautiful carved wood ceiling, and known as the Salle Henry II. Within twelve months the following portions in the Museum have been opened to the public—eleven rooms containing the antique ceramic works of the Musée Napoleon III., three others occupied by the pictures from the Musée Campana, two containing objects of the period of the Renaissance, and the two new galleries which now contain the pictures of the French school.

Manufactures.

Town Window-Gardens.—It appears, by an article in the *Gardener's Chronicle*, that the Coalbrookdale Iron Company have recently brought out a convenient apparatus for facilitating the arrangement of flowers outside windows. A semi-circular iron flower-bed, four feet in width by two feet of projection and nine inches in depth, receives, besides the broken crocks, &c., for drainage, two barrowfuls of garden mould, affording (even in cities, especially at upper windows, where the stratum of air is purer), the production of large groups of flowers in great perfection. These window gardens afford great safety at nursery windows, a little light wiring for creeping plants being in addition, if desired, affixed at and above the out circle of the gardens. These window gardens are made of iron, either galvanized or treated with anti-corrosive material, and the company call attention to their safe and easy mode of fixing. A wrought-iron bent bar, somewhat like a horse-shoe in shape, supporting the window bed, is first put into the wall by two holes, and fixed by cement, which is done without scaffold and from ladders, and remains to set without weight being put on it; and next day the garden bed can be lifted in from the windows on to this, no bolts being requisite. This done, the bed may at once receive the crocks and garden mould, and the flowers be planted in the earth, level with the top of the sill. In the cases of the sills being part of a string course, or in any other case, the company have modes of modification so as to meet all circumstances. In all cases, however, the main support depends on the wrought-iron bars beneath let into the wall. The correspondent of the above journal says:—"We must remember the incalculable advantage to all town and London-grown plants of being lifted up from the ground. The first time I tried the plan myself it was where there was a back garden, deep down and well-like, in which not a thing would grow. A little breakfast-room window looked out upon this 'dampery,' and there I got my boxes fixed, raised above the level of the surrounding walls, the plants enjoying the free current of air that now passed round them. The way in which that garden throve attached me for life to this plan. The soot and smoke may be bad in towns, but that I don't think is the real grievance. It can after all be washed off; it is the stagnant air, or the no light in some cases—the scorching sun in others—that kills and stunts town plants. All these worst of evils, because those beyond our own remedy, it seems to me are removed by these iron window gardens. The one that I saw in use was filled with spring bulbs and flowers, and these, as I understood, were planted in the soil. But I would advise all gardeners on setting up these contrivances to use abundant charcoal drainage, and then above it a layer of cocoa-nut fibre or else dry moss or grass. The same padding I think may well extend round the front rim. The plants can then be kept in their own pots by all means, and clematis, cobœa scandens, and sweet pea, canariensis and ipomœa, ivy and convolvulus, I know will flourish luxuriantly. Roses I have had flower well, but not in a very smoky place; stocks, mignonette, lobelias, geraniums, and heliotropes, arums, and fuchsias have also grown and flowered well. It is chiefly, I imagine, because they can be well watered, and because they have the great benefit of free air. And then what a benefit they are to our little dull-looking breakfast rooms or studies, and what a very great pleasure they will give to the London artisans, than whom few are more hearty flower lovers or more interested gardeners, if they can have for their parlour window such a country-like bed of sweet flowers." In the window-gardens already produced by the Coalbrookdale Company the decorations consist of natural objects, such as birds, &c., for which their foundry is distinguished, and some of these are to be exhibited in the Horticultural Gardens on the Queen's birthday.

Colonies.

THE ALPACA IN AUSTRALIA.—The last accounts from Australia state that all the hopes which had been entertained of the naturalisation of the Peruvian alpaca have been disappointed. Of the 300 introduced by Mr. Ledger from Peru, five years ago, and purchased by the government of New South Wales for £15,000, the whole have died off, and their progeny, numbering 330, are in an unhealthy condition. During a discussion on the subject in the colonial legislature nearly every speaker was in favour of the government immediately getting rid of the cost of keeping them, and a resolution was accordingly adopted that they should be disposed of as soon as possible.

MELBOURNE TRADE.—The following table gives the imports and exports at the port of Melbourne for the first six weeks of the year as compared with the corresponding weeks of 1863:—

Imports, 1863...	£1,896,272	Exports, 1863 ...	£1,641,418
,, 1864...	2,204,241	,, 1864...	1,420,745

Stocks of goods in bond at Melbourne on 20th February:—brandy, 6,011½ hhds., 84,259 cases; rum, 1,096½ hhds., 1,079 cases; gin, 132 hhds., 176,461 cases; whiskey, 1,084 hhds., 25,598 cases; sugar, 241 casks, 224,624 bags; coffee, 714 casks, 514 bags; tobacco, 669 casks, 9,638 cases and bales.

Notes.

THE ALBERT MEMORIAL.—The works in connexion with this national memorial have been commenced by Mr. Kelk, to whom the execution of the entire contract has been intrusted. The site chosen for it is in Hyde-park, almost facing the entrance to the Horticultural-gardens, and on this spot the excavations for the foundation are being made. From the great height (160ft.) and the immense solidity and massiveness of the memorial, the foundations have to be taken unusually deep, considering the excellent nature of the soil, which is all gravel. Under the centre part they are to be formed of 16 feet of concrete, and nowhere are they to be less than 10 feet. The base of the memorial is to consist of broad and lofty flights of steps that give access to the work on four sides, and the work itself is to be no less than 130 feet square. The steps of gray granite are to be laid in a double flight, with a broad landing between the lower and upper tier. From this upper landing the memorial proper will rise, the basement being formed of a noble frieze in marble, the figures on which will be in high relief and of life size. The columns which support the spire-like superstructure of the memorial are to consist of groups of four red granite pillars, each 2ft. in diameter. Their capitals are exceedingly rich, and will be surmounted with statues of heroic size. The spire, if it may be so called, which closes in the arch, is one of the richest and most elaborate of all Mr. Scott's designs. It will be built of red and gray granite, and the rich white stone known as Darley Dale. The terminal and surmounting cross will be of wrought copper gilt, and this portion of the work is to be executed by the Skidmore Art Company, whose rood screen in the transept of the last Exhibition excited such admiration for its exquisite finish. Beneath the groined arch will be placed the statue of the late Prince Consort. His Royal Highness is represented in robes of state, seated on a chair of state. The proportions of the figure are on a scale which, if the statue was represented standing, would give it a height of 30ft. The details of this figure and of the other groups of statuary which will surround the memorial are, however, still undecided. The whole work is expected to take four years in completion, and by the terms of his contract Mr. Kelk has bound himself to complete it for the sum in hand, £120,000. The laying of the foundation stone will be marked by a public ceremonial, at which the members of the royal family will be present. No date is fixed for this event, which, indeed, is not likely to take place till late in autumn.

THE DUBLIN EXHIBITION.—This will be held in the same building in which took place its predecessor of 1861. For some time past preparations have been going on; the nave has been divided from the wings of the hall by a wooden partition, the whole has been boarded over and painted in light colours, and behind the main building, in the space known as the Shelbourne-yard, now stands a building of iron and glass which will be devoted to the purposes of a machinery court. All the space to be disposed of has been parcelled off. The principal Irish manufacturers are among the exhibitors; and the most eminent makers of machinery in England also contribute. The department of the Fine Arts promises to form a most attractive feature. The National Gallery and the South Kensington Museum will send contributions; continental artists, as well as English and Irish collectors, are sending some of their best pictures. Irish artists, of course, have not neglected this opportunity of displaying their powers. An imposing inauguration is promised for the 25th of May, for which Dr. Waller has produced an appropriate ode, the music by Dr. Stewart, while all the leading artistes of the city are engaged as vocalists, and 200 ladies and gentlemen are to form a chorus. The prospectus says:—"The principal department will consist of articles of exclusively Irish manufacture. The machinery court will contain machines of the newest and most improved construction, suited to manufactures of various kinds, amongst which will be exhibited the most modern appliances used in the production of linen and woollen fabrics, and which will be exhibited in motion. Each of the varied industries of the country will be fully represented. Specimens of all the minerals of the country will be exhibited. How the water-power of the kingdom may be economised, so as to employ it in manufactures at a small expense, will be shown. How the bogs may be utilised, so as to render them sources of wealth, will also be exhibited by the application of new and important discoveries. It is intended to have musical performances, upon an enlarged scale, morning and evening, during the Exhibition."

Correspondence.

VACANT NICHES IN LONDON.—SIR,—Your last correspondent on this subject mentions, among niches vacant in London, the numerous ones which occur in the outer walls of St. Paul's Cathedral, and it may be hoped that while the authorities are occupied in the decoration of the interior of the building the outside will not be neglected. Both your correspondents allude to the use of terra-cotta for such decorative subjects as should complete the effect of the edifices they mention. I suppose neither of them are among those who have been deceived in the use of this material, by having purchased terra-cotta vases either made of bad materials or insufficiently baked. The truth is, I believe, that some terra-cotta is mere rubbish, and will not stand the atmosphere, and this material for art has fallen into much disrepute in consequence in some quarters. This is, however, unfair to really good terra-cotta, fully baked, or "fired," as the manufacturers call it. Such terra-cotta is, I believe, among our most durable materials, while other terra-cottas, insufficiently submitted to the action of fire, are more like what the builders call a "salmon brick," and are not to be depended on when exposed to the alternate action of frost and sun. The less-burnt terra-cotta will answer very well for interiors, and many of the sketches of figures and groups by the Italian masters, not intended for exposure, are in this lightly-burnt terra-cotta, but such material as this would not do for the open air in such a climate as ours. As

terra-cotta offers advantages, from its comparative cheapness and ease of repetition, it might be well that it should be relieved from any odium occurring from previous failures in the open air of unsuitable specimens, and that in future care should be taken in selecting, for exposed situations, only such qualities of terra-cotta as will stand wind, rain, sun, and frost.—I am, &c., VITREUS.

MEETINGS FOR THE ENSUING WEEK.

MON. ...R. Geographical, 1. Annual Meeting.
TUES. ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Mr. G. R. Burnell, "On the Machinery employed in Sinking Artesian Wells on the Continent."
Zoological, 9.
Ethnological, 4. Annual Meeting. 8. Dr. Donovan, "On Empirical and Scientific Physiognomy as applied to the Study of Races of Man and Individuals."
Royal Inst., 3. Professor Marshall, "On Animal Life."
Linnæan, 3. Annual Meeting.
WED....Geological, 8. 1. Capt. Godwin-Austen, "Geological Notes on part of the North-Western Himalayas." Communicated by Mr. R. A. C. Godwin-Austen, F.R.S. 2. Prof. T. H. Huxley, F.R.S., "On the Cetacean Fossils termed *Ziphius* by Cuvier." 3. Mr. W. B. Dawkins, "On the Rhætic Beds and White Lias of West and Central Somerset."
Archæological Assoc., 8½. 1. Rev. Mr. Cardew, "On Sepulchral Antiquities found at Helmingham, Suffolk." 2. Mr. Pettigrew, "Obituary Notices of Members deceased during 1863."
THUR. ...Royal, 8½.
Antiquaries, 8.
Philosophical Club, 6.
Royal Inst., 3. Mr. John Hullah, "On Music (1600—1750)."
FRI.......Royal Inst., 8. Mr. Reginald S. Poole, "On Greek Art."
SAT ......R. Botanic, 3¾.
Royal Inst., 3. Mr. Alex. Herschel, "On Falling Stars and Meteorolites."

PARLIAMENTARY REPORTS.

Par. Numb.

Delivered on April 21st, 1864.

206. Regium Donum—Return.
208. Army Prize Money—Account.
211. Army (Sums paid in lieu of Pension, &c.)—Statement.
212. Army (Officers on half-pay with Civil Situations)—Return.
220. Malta New Dock—Return.
117. British Museum—Returns.
71. Bills—Penal Servitude Acts Amendment (amended).
72. — Charitable Assurances Enrolments.
73. — Customs and Inland Revenue.
74. — Promissory Notes and Bills of Exchange.
China (No. 5)—Memorials, &c., on the subject of opening up a direct Commerce with the West of China from the Port of Rangoon.

Delivered on 22nd April, 1864.

173. Woods, Forests, and Land Revenues—Abstract Accounts.
192. Ancient Laws and Institutes (Ireland)—Paper.

Delivered on 23rd and 25th April, 1864.

202. Greenwich Hospital—Returns.
205. West India Incumbered Estates Act (1862)—Returns.
153. Life Boats, &c.—Return.
168. Post Office Savings Banks—Account.
183. National Debt (Savings Banks)—Account.
210. Queen's College (Cork)—Copy of Correspondence.
225. Manufacturing Districts Acts (1863)—Report by Robert Rawlinson, Esq.
226. Seat of Under Secretary of State—First Report from Committee.

Delivered on 26th April, 1864.

216. Broadmoor Criminal Lunatic Asylum—Report of the Commissioners in Lunacy.
219. Barnstaple Election Petition—Minutes of Evidence.
224. Pollution of Streams—Copy of a Letter.
Civil Service Commissioners—Ninth Report.

Delivered on 27th April, 1864.

187. Army (Maps, &c.)—Return.
214. Dublin Port—Return.
North America (No. 10)—Despatch from Lord Lyons, referring to the alleged Report of the Secretary of the Navy of the so-styled Confederate States.

Delivered on 28th April, 1864.

105. Post Office Packet Service—Estimate.
201. Immigrants and Liberated Africans—Return.
218. Ancient Laws and Institutes (Ireland)—Return.
228. Army, &c.—Account of Receipt and Expenditure.
76. Bills—Summary Procedure (Scotland) (amended).
77. — County Bridges.
78. — Court of Chancery (Ireland).
79. — Civil Bill Courts (Ireland) (amended in Committee and on re-commitment).
80. — Local Government Supplemental.
81. — Lands and Heritages (Scotland) Act Amendment.

Delivered on 29th April, 1864.

66 (3). Trade and Navigation Accounts (31 March, 1864).
226. Seat of Under Secretary of State—First and Second Reports from Committee.
235. Bankruptcy (Ireland)—Return.
Charity Commission (England and Wales)—Eleventh Report.
Greece (No. 1)—Papers.
Greece (Union of the Ionian Islands)—Treaty.
Greece (Claims for Services in the Ionian Islands)—Convention.

Delivered on 30th April and 2nd May, 1864.

221. Teinds (Scotland)—Return.
233. Sheffield, Chesterfield, and Staffordshire Railway Bill—Minutes of Evidence.
234. National Portrait Gallery—Seventh Report of Trustees.
239. Army (Limited Service)—Return.

Patents.

From Commissioners of Patents Journal, May 13th.

GRANTS OF PROVISIONAL PROTECTION.

Axle tree with levers—749—A. Blouin and N. D. Mercier.
Buttons—278—P. W. Gengembre.
Carriages, &c., tin-expanding canopy for—947—T. L. Scowen.
Clothes, &c., washing and wringing—1056—T. J. Searle.
Coining, machinery for—998—J. Abraham.
Dancing toys—61—M. B. Westhead.
Emery papers—827—R. J. Edwards.
Hydro-carbon oils, &c., treatment of—1021—J. E. Duyck.
Lamps—943—G. A. Tremeschini.
Looms—936—J. Bullough.
Musical instruments—935—P. A. L. de Fontainemoreau.
Puddling iron—885—J. Lloyd.
Quillai tree, obtaining a semi-fluid or solid product from—999—H. A. Bonneville.
Ships' cooking apparatus—945—A. R. Le Mire de Normandy.
Steam, apparatus for condensing—1051—W. Thorold.
Titanic iron sands—1058—B. F. Brunel.
Urinals—1043—J. Symes.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Corks, bungs, &c., machinery for cutting—1133—W. Davies, and G. and W. Cate.

PATENTS SEALED.

2874. C. W. Harrison.
2879. V. Baker.
2881. W. Pratchitt, J. Blaylock, and J. Pratchitt.
2882. T. C. Kimpton.
2891. J. Mackey.
2893. J. C. Jennings and M. L. J. Lavater.
2897. J. Eglin.
2903. J. Kirkham.
2904. E. Walker.
2905. J. Colyer.
2907. E. Christmas.
2911. W. B. Hodson.
2912. G. Rait and J. Winsborrow.
2913. J. Seward and H. Smith.
2915. B. Dobson, E. Barlow, and P. Knowles.
2918. A. H. Ferry.
2921. T. Brinsmead.
2931. F. Fenton.
2932. W. Williams.
2935. E. Finch.
2937. A. Simoncton.
2940. M. B. Westhead.
2960. J. Sibert.
2962. C. L. Daboll.
2987. H. Hirzel.
3083. J. Aubert.

From Commissioners of Patents Journal, May 17th.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1239. W. Mitchell.
1197. W. Wilson.
1198. C. W. Lancaster.
1225. J. Bullough and J. Bullough.
1310. R. Mushet.
1226. G. S. Goodall.
1282. J. Sidebottom.
1253. D. K. Clark.
1258. T. Dunn.
1267. P. Ashcroft.
1275. J. Hughes.
1276. F. O. Ward.
1278. W. Clark.
1286. G. E. Donisthorpe.
1294. Y. Parfrey.
1302. G. E. Donisthorpe.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1320. C. W. Siemens.
1340. J. R. Cochrane.
1345. S. Yeldham.
1363. G. Crawford.
1404. E. A. Cowper.
1344. T. Briggs and J. Starkey.
1470. J. Crossley.

Registered Designs.

Rack pulley—4633—Frank P. Fellows, Snow-hill Works, Wolverhampton.
Lever rod for expelling exploded cartridge cases from repeating fire-arms—4634—Phillip Webley and Sons, Birmingham.
Frame for bags and other like receptacles—4635—Moritz Bergman and Company, 21, Queen-street, E.C.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, MAY 27, 1864. [No. 601. Vol. XII.

Announcements by the Council.

Presentation of Medals and Prizes.

His Royal Highness the Prince of Wales, K.G., President of the Society, has been pleased to appoint Friday, the 24th of June, at three o'clock, to present the medals and prizes awarded during the present Session. The Presentation will take place at Willis's Rooms, King-street, St. James's. Members will be admitted by ticket only, for which application should be made to the Secretary; each ticket to admit the member and one lady. The tickets will be ready for delivery on and after the 1st June.

Dwellings of the Labouring Classes.

The special Conference on this subject commenced yesterday at the Society's House, and will be continued this day (Friday, the 27th inst.), commencing at 11.30 precisely. A Report of the proceedings will appear in next week's *Journal.*

Conversazione.

The Council have arranged for a Conversazione at the South Kensington Museum on Thursday evening, the 16th June, cards for which will shortly be issued.

Notice to Institutions and Local Boards.

The Thirteenth Annual Conference between the Council and the Representatives of the Institutions in Union and Local Boards, will be held on Thursday, the 16th June, at Twelve o'clock, noon. William Hawes, Esq., Chairman of the Council, will preside.

Secretaries of Institutions and Local Boards are requested to forward, as soon as possible, the names of the representatives appointed to attend the Conference.

The Council will lay before the Conference the Secretary's Report of the proceedings of the Union for the past year, and the Results of the Examinations.

The Programme of Examinations, Elementary and Final, for 1865, will also be laid before the Conference.

The following subjects are suggested for discussion :—

1. In what manner can the agents of the District Unions, who have been appointed agents to the Society of Arts in their respective localities, best carry out the objects of the Society, and promote the welfare of the Institutions?
2. The advantages of District Unions; how the Society of Arts may best promote their formation, and aid them when formed?
3. The best means of developing the social character of the Institutions.
4. The best mode of promoting Popular Readings as a department of the work of Institutions.
5. What is the influence of the Working Men's Clubs, formed in various localities, on the educational character of the Institutions in those localities?
6. The best means of providing for the Education of Women and Girls after they have left their Day-schools.
7. Would it be desirable to add "Needlework" to the subjects of Examination in the Programme of the Society of Arts?
8. How can Physical Education be promoted by the Institutions, by the District Unions, and by the Society of Arts?
9. The advantages of "Youths' Institutes," *i.e.*, separate Institutes, or separate departments of Institutes, for Youths?
10. The Prizes for Art-workmanship annually offered to Art-workmen by the Society of Arts; how far can the District Unions, Local Boards, and Institutions, assist in giving publicity to this competition, and in encouraging those likely to be competitors?
11. Would it be desirable to allow a certain limited share in the government of Institutions to such of the members as may have obtained Certificates in the Examinations?
12. If the Society of Arts were to publish a calendar, with the names of all candidates who have obtained certificates and prizes from 1856 to 1864, at a price to be named, would there be any considerable number of copies subscribed for?

Notice of any other subjects which representatives may desire to bring forward for discussion should be given to the Secretary of the Society of Arts.

The Secretary of each Institution is requested to forward, by book-post, a copy of the Annual Report of his Institution.

Representatives of Institutions and Local Boards attending the Conference are invited to the Society's Conversazione, at the South Kensington Museum, on the evening of the same day (16th June), and will receive cards on application at the Society's House, on the day of the Conference.

Prizes for Art-Workmen.

The Council of the Society of Arts offer prizes to Art-Workmen as follows:—

1st Division.

Works to be Executed from Prescribed Designs.

Class 1.—Carving in Marble, Stone, or Wood.

(*a.*) *The Human Figure.*—Two prizes of £15 and £7 10s. respectively. Subject:—The Boy and Dolphin cast from a chimney-piece, ascribed to *Donatello.*

(*b.*) *Ornament.*—Two prizes of £10 and £5 respectively. Subject:—A carved chair-back.

(*c.*) *Ornament.*—Two prizes of £10 and £5 respectively. Subject:—A *Gothic bracket.*

(*d.*)—Two prizes of £20 and £10 respectively. Subject:—A design by *Holbein*, as an *Inkstand* or *Watch-Holder.*

(*e.*)—Two prizes of £15 and £7 10s. respectively. Subject:—*Head of a Harp* of the period of Louis XVI.

(*f.*) *Ornament.*—Two prizes of £10 and £5 respectively. Subject:—An *Italian picture frame.*

Class 2.—Repoussé Work in any Metal.

(*a.*) *The Human Figure as a bas-relief.*—Two prizes of £10 and £5 respectively. Subject:—*Raphael's "Three Graces."*

(*b.*) *Ornament.*—Two prizes of £5 and £3 respectively. Subject:—A Flemish salver.

Class 3.—Hammered Work, in Iron, Brass, or Copper.

Ornament.—Two prizes of £7 10s. and £5 respectively. Subject:—A portion of the Pediment of a Gate (German work, date about 1700).

Class 4.—Carving in Ivory.

(*a.*) *Human Figure in the round.*—Two prizes of £15 and £10 respectively. Subject:—An *Ivory*, by *Fiamingo.*

(*b.*) *Ornament.*—Two prizes of £7 10s. and £5 respectively. Subject:—A pair of *Tablets.*

Class 5.—Chasing in Bronze.

(*a.*) *The Human Figure.*—Two prizes of £10 and £5 respectively. Subject:—A reduced copy of "*Clytie.*"

(*b.*) *Ornament.*—Two prizes of £10 and £7 10s. respectively. Subject:—A cabinet, by Goutier.

Class 6.—Etching and Engraving on Metal—Niello Work.

Ornament.—Two prizes of £10 and £5 respectively. Subject:—Arabesques, by Lucas Van Leyden, 1528.

Class 7.—Enamel Painting on Copper or Gold.

(*a.*) *The Human Figure.*—Two prizes of £10 and £5 respectively. Subject:—*Raphael's design of the "Three Graces."*

(*b.*) *Ornament.*—Two prizes of £5 and £3 respectively. Subject:—A German arabesque (16th century).

Class 8.—Painting on Porcelain.

(*a*) *The Human Figure.*—Two prizes of £10 and £5 respectively. Subject:—*Raphael's "Two Children,"* in the cartoon of "*Lystra.*"

(*b.*) *Ornament.*—Two prizes of £5 and £3 respectively. Subject:—Arabesques, by Lucas Van Leyden, 1528.

Class 9.—Decorative Painting.

(*a.*) *Ornament.*—Two prizes of £5 and £3 respectively. Subject:—An *ornament*, from *Castel R. Pandino*, near Lodi.

(*b.*) *Ornament.*—Two prizes of £5 and £3 respectively. Subject:—A *picture frame*, in the South Kensington Museum.

Class 10.—Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.

Ornament.—Two prizes of £5 and £3 respectively. Subject:—A specimen.

Class 11.—Cameo Cutting.

(*a.*) *Human Head.*—Two prizes of £10 and £5 respectively. Subject:—*Wyon's* heads of the Queen and the Prince Consort, on the Juror's medal of 1851.

(*b*) *Animal.*—Two prizes of £10 and £5 respectively. Subject:—*Wyon's "St. George and the Dragon,"* on the Prince Consort's medal.

Class 12.—Engraving on Glass.

Ornament.—Two prizes of £5 and £3 respectively. Subject:—Arabesques by Lucas Van Leyden, 1528.

Class 13.—Wall Mosaics.

Human Head.—Two prizes of £15 and £10 respectively. Subject:—A work by *Bertini*, of Milan.

Class 14.—Gem Engraving.

(*a.*) *Human head.*—Two prizes of £10 and £5 respectively. Subject:—An original Gem.

(*b.*) *Full-length figure.*—Two prizes of £10 and £5 respectively. Subject:—An original Gem.

Class 15.—Die Sinking.

Human head.—Two prizes of £10 and £5 respectively. Subject:—The head of the Prince Consort, by *Wyon*, on the Society's medal.

Class 16.—Glass Blowing.

Ornament.—Two prizes of £7 10s. and £5 respectively. Subject:—An original in the South Kensington Museum.

Class 17.—Bookbinding and Leather Work.

(*a.*) *Bookbinding.*—Two prizes of £7 10s. and £5 respectively. Subject:—An Italian specimen in the South Kensington Museum.

(*b.*) *Leatherwork.*—Two prizes of £7 10s. and £5 respectively. Subject:—A specimen of boiled and cut leatherwork for the outside covering of a jewel casket, the original being in the South Kensington Museum.

Class 18.—Embroidery.

Ornament.—Two prizes of £5 and £3 respectively. Subject:—A German example in the Green Vaults at Dresden, or an Italian Silk in the South Kensington Museum.

2nd Division.

Works to be Executed without Prescribed Designs.

Wood Carving.

(*a.*) *Human figure in alto or bas relief. Animals or natural foliage may be used as accessories.* 1st prize of £25 and the Society's Silver Medal. 2nd prize of £15. 3rd prize of £10.

(*b.*) *Animal or still-life. Fruit, flowers, or natural foliage, may be used as accessories.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

(*c.*) *Natural foliage, fruit, or flowers, or conventional ornament in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

All articles for competition must be sent in to the Society's house on or before Saturday, the 26th of November, 1864, and must be delivered free of all charges. Each work sent in competition for a Prize must be marked with the Art-workman's name, or, if preferred, with a cypher, accompanied by a sealed envelope giving the name and address of the Art-workman.

Photographs, engravings, &c., of the above subjects, may be purchased at the Society's house at cost prices. Full particulars, with conditions, may be obtained from the Secretary of the Society of Arts, to whom all persons desiring to become competitors should apply.

Proceedings of Institutions.

Metropolitan Association for Promoting the Education of Adults.—The committee of the above Association, being desirous of giving encouragement to physical exercises and games of strength and skill among the working classes, and also to afford the members of the Literary and Mechanics' Institutions, Working Men's Clubs, Young Men's Societies, &c., in union with the Association an opportunity for a social re-union, have arranged for a gathering at the Crystal Palace on Monday, June 27. In addition to the various attractions at the Palace, arrangements have been made for a series of athletic sports, for which money prizes will be given; there will also be an open air concert of 800 voices, under the direction of Mr. G. W. Martin; a balloon ascent; a grand organ performance; and a prize contest of cadet bands. The Band of the Crystal Palace Company will play during the day within the Palace, and the Band of the Greville House Working Men's Institute, and the Kingsland Sub-division of Metropolitan Police, N Division, in the Palace grounds. Excursions are being organised by Institutions in union, all expenses, apart from the purchase of tickets, being borne by the Association.

Yorkshire Union of Mechanics' Institutions.—The annual conference of this Union was held on the 18th instant, in the lecture-hall of the Mechanics' Institution, Surrey-street. Breakfast was provided in the building for the delegates and friends, and shortly after eleven o'clock the business meeting commenced. The chair was taken by Edward Baines, Esq., M.P. for Leeds, President of the Union, and amongst the gentlemen present were J. A. Roebuck, Esq., M.P.; Rev. Canon Sale, D.D., Vicar of Sheffield; Rd. Rumney, Esq., Vice-President of the Manchester Mechanics' Institution, and others. After some preliminary business, the Conference next year was fixed to take place at Stockton-on-Tees. Mr. Buckmaster, of the Department of Science and Art, introduced the first subject for discussion—"The promotion of class instruction in science, and the aid afforded by the Department of Science and Art." He gave an outline of the scheme of the department, upon which a discussion ensued. One of the representatives expressed some doubt whether the certificated teachers could depend upon the promises of the department. In his opinion the department would probably in a few years withdraw its support. Another gentleman gave an account of the progress of the Manchester Mechanics' Institutions, but expressed his conviction that the system of payment to teachers induced them to devote all their energies to training boys in special subjects, to the neglect of that which was more important—a good, sound, commercial and general education. Mr. Christopher Thompson introduced the subject of "The system of elementary examinations as an incentive to pupils of elementary classes, as well as a preliminary to the final examinations of the Society of Arts." Rev. Henry Solly introduced the next subject, "How far Mechanics' Institutes can legitimately introduce more attractive features so as to induce larger numbers of the operative classes to attend them." The merits of Working Men's Clubs were discussed and various opinions were expressed as to the advisableness of grafting the "club" on to the "institution." Several delegates who advocated the retention of the present system, contended that the Working Men's Clubs would thin the ranks of the institutes, but others argued that the workmen who entered the clubs were altogether a different class from those who recruited the classes in the Mechanics' Institutions. The Rev. T. Hincks warned the delegates against departing from the strict line of the work which the institutes were established to carry out. It would be a fatal day for Mechanics' Institutions when their managers turned their backs upon the old course, and began to compete with places of a lower character. Mr. Fisher was in favour of so modifying these institutions that they might become attractive to young persons. Mr. Rumley showed that in every place in Lancashire where prominence had been given to amusements the institutions had failed; wherever it had kept to the work of class instruction, it had succeeded. Mr. Roebuck, M.P., moved, "That this meeting desires gratefully to acknowledge the long-continued service of Edward Baines, Esq., M.P., as President of the Yorkshire Union of Mechanics' Institutions, and thanks him, and warmly, for the courtesy and ability with which he has performed the duties of chairman at this conference of delegates." It had always been a dream of his—to see the working classes of this kingdom raised up to the enjoyment experienced by the intellectual classes that are above them. He believed that time was approaching. A great change was now taking place among the working classes of this kingdom. On Whit-Monday 35,000 people met at the Crystal Palace, and 30,000 at the Horticultural Gardens, and there was not the slightest disturbance, all having conducted themselves well. He believed that the institution, of which Mr. Baines was so worthy a president, would bring about that which had been his life-long dream—the raising of the working classes up to the due intellectual enjoyment that was now the appanage of the richer clsses of society. The motion was carried with acclamation, and in acknowledging the compliment, the Chairman said he rejoiced to be able to do anything to raise the intellectual and moral condition of the working classes. The conference then separated. The delegates dined together in the Cutlers' Hall. A meeting in the evening was held, and was numerously attended. The Duke of Argyll, Lord Privy Seal, took the chair, and, in opening the proceedings, said they were met to promote the prosperity of the Union of the Yorkshire Mechanics' Institutes. They knew that it was almost a joke that mechanics' institutions were institutions in which there were no mechanics. He did not think that was true, as regarded the mechanics' institutions of Yorkshire. At the same time it was perfectly true that the class of mechanics and artisans had, to a large extent, betaken themselves to working men's clubs and other institutions of a similar kind; but if he rightly understood the information which had been given to him by Mr. Baines, this union was not merely a union of mechanics' institutions strictly so called, but those who carried it on would be very glad to see connecting themselves with this union all institutions formed for the education of the middle and working classes of Yorkshire. The great advantage of such unions was that they extended to the education of the working classes the stimulus of examinations, introducing that principle of competition which had been found so valuable in our public schools and universities. Anther advantage would be that the education would become definite, and less slovenly in its character than at present. After advocating systematic study, and urging the importance of education in elementary subjects, his Grace referred to the Examinations of the Society of Arts and of the Department of Science and Art, saying that a main object of mechanics' institutions was to give scientific instruction to artisans in their various trades and occupations. In that respect, as in others, they had very much failed; but an excellent system had been established by which certificates and prizes were given to those who qualified themselves for industrial avocations. In this field the middle and working classes were left almost to themselves, inasmuch as science was almost neglected in our great public schools. He earnestly impressed upon the union the necessity of giving great attention to this part of their work. As to the bearing of these institutions upon elementary education, it was a most extraordinary circumstance that England should have come to be what she was without having had a system of national education, such as Scotland had had to her great advantage

ever since the Reformation. It was a question of great and growing importance as to what great ends, what good objects, could be obtained by legislation; what were those which must be left to be attained, if at all, by the public; and what were those which we were entitled to procure, if we could, by the higher forms of legislative action. In former times the great evil was not over but under legislation. There had been a gradual reform in this respect, but concurrently with the progress of free trade came the conviction of the necessity for direct legislation in the matter of education. He looked upon the Factory Education Act as of the greatest importance, and wished to see it more extensively applied to other classes of the community. He believed the master manfacturers generally had cordially co-operated in this matter. That the working people were, in one sense, highly educated, was shown by their conduct during the distress, and we had already proved in this country that the best way to make the people fit for freedom was simply to make them free. Another advantage of these institutions was that they promoted a cordial union and co-operation of classes. It was through such unions as this that they might hope to see the various classes of our country "Bound each to each by natural piety." Mr. ROEBUCK, M.P., in moving the adoption of a resolution expressing approval of the object of the union, said he had witnessed to-day events that to him had appeared important and of exceedingly good augury. He had seen met together a large body of thinking men, earnestly intent on promoting better education among the working classes of this country, propounding each his own particular views, with the greatest possible courtesy manifested by all to all; and throughout the whole discussion not one single word or any appearance of anger was manifested. That appeared to him to be an omen of good. He had often advocated the opinion that there was nothing in the necessity of earning a livelihood by manual labour that degenerated the mind of a man or his character, and he knew no reason why the working man could not be as much a gentleman as the greatest in the land. It was also a good augury that his grace should have honoured them with his presence. The aristocracy now interested themselves to raise, ennoble, and refine the classes they governed: and he took it to be one of the most beneficial things that could happen amongst any people that its leading men were interesting themselves in the fortunes and happiness of those around them. With regard to the interference of the State in education, he had at one time been opposed to it, but he had altered his opinion. He believed the time was rapidly approaching when the State would understand what it ought to do with regard to popular education. Every year would confirm the opinion that the education of the people was amongst the first and most important duties of Parliament. Mr. JOHN MARSHALL seconded the resolution, and Mr. EDWARD BAINES, M.P., explained the operations of the Yorkshire Union of Mechanics' Institutes, and proposed a resolution to the effect that it was "especially deserving of a continued and increased amount of public sympathy and support." Mr. RUMLEY, President of the Lancashire Union of Mechanics' Institutes and of the Manchester Institute, in seconding the resolution, said that the success of these Institutions depended more on the directors of them than on anything else. If the right men were at the head, the prosperity of an Institution was secured. The Rev. CANON SALE, D.D., moved—"That this meeting warmly acknowledges its appreciation of the great and valuable services rendered by the West Riding Educational Board to the Institutes of Yorkshire, in promoting the adoption of the system of examinations of the Society of Arts, and all other examinations in which the members of institutes may participate." He expressed his sympathy with the object of mechanics' institutes. Mr. DUNN seconded the resolution. The MAYOR proposed a vote of thanks to the Duke of Argyll, which was duly acknowledged.

GOLD MINING IN VICTORIA.

BY MR. PHILIP A. EAGLE.

CHAP. I.

HISTORICAL SKETCH—MANAGEMENT—PRODUCE—CAUSES OF DECLINE—POPULATION—REMARKS.

The desire for gold has given the impulse to almost every great movement which has contributed to the distribution of the human race.

We learn from history the numerous conquests, invasions, and explorations, that have been effected under the direct influence of what the poet designates the "auri sacra fames;" how in the middle ages unparalleled hardships were endured in the eager search for some hidden Eldorado; how lands were depopulated by exterminating warfare, and again repeopled by the adventurous thousands of the old world.

But the most signal exhibition of the power of the precious metal was reserved for the 19th century, and in the development of the two chief gold-producing countries of modern times, we witness a progress that has no parallel in the annals of colonisation.*

The winter of 1851 was a memorable epoch in the history of Victoria. Its political enfranchisement, the erection of the settlement into an independent province, was almost immediately followed by the finding of gold in several parts of the territory.

The first public announcement of a gold field was made on the 5th of July, and within a space of five weeks, Ballarat, Mount Alexander, Clunes, and Anderson's Creek, were opened. Gold had been found at Port Philip prior to 1851. Brentani's nugget (a mass of gold), obtained in the Pyrenees in 1846, and a number of small specimens of native gold, which had been picked up at various times by station owners and shepherds in other parts of the settlement, added to the more recent discoveries of Dr. Bruhn (a mineral explorer who commenced his labours in January, 1851) near Parker's station, as far back as April—and before the finding by Hargraves—may be said to have aroused attention to the auriferous deposits in the colony. The first report was made by a Mr. Campbell, who, in company with a squatter, picked up pieces of gold in quartz at Clunes, in March, 1850, but the owner of the station (Donald Cameron), apprehensive of injury to his "run" following the announcement, concealed the discovery. On the 10th June, 1851, Mr. Campbell informed Mr. Graham, M.L.C., that within a radius of 15 miles of Burn Bank, on another station run, he had procured gold. Dr. Bruhn dispatched his specimens to the gold discovery committee, which, however, were not received until the 30th June. Michell's party exhibited specimens on the 5th July, which they had obtained at Anderson's Creek, Yarra ranges, and this was undoubtedly the first proved gold field in Victoria. Esmond's discovery at Clunes was also made known at Geelong on the same day (5th July), and Hiscock (who had for some time instituted a search for gold in his neighbourhood), found at Buninyong, the prelude to Ballarat, on the 8th August. To each of these gentlemen (with the exception of Dr. Bruhn, who received £500) the government awarded £1,000. The earliest disclosure of the mineral wealth of Forest Creek is due to a shepherd, named Christopher Peters, who was employed on Barker's station. It appears that Peters found alluvial gold at Specimen Gully on the 20th July, and immediately associated with him three others (also in the same employ), to aid him in reaping the benefit of his exciting discovery. They continued to work the ground with secresy and success during the following month. On the 1st of September, having become uneasy as to the consequences which might accrue from their unauthorised appropriation of the produce, one of the men, on behalf of the party, "to prevent

* Within the past 12 years the population of the colony of Victoria has increased eightfold.

them getting into trouble," caused to be published in a Melbourne journal an announcement of the situation of their workings. This notice, ambiguously worded, and rendered still more so by the locality being described as "at Western Port," introduced to the world the treasures of Mount Alexander. The richness and extent of the two last-named fields soon withdrew attention from the minor discoveries of Esmond, Michell, and others.

The differences which, at an early period, existed between the authorities and the miners at Ballarat, and which terminated in the painful affair of the Eureka Stockade, partially suspended operations on a favourite ground, but a short interval (improved by an official administration less obstructive) sufficed to witness its re-occupation.

Thenceforth the future of Ballarat was to be scarcely less brilliant than the experience of old "Canadian" times.

Looking at the successful results which have crowned the system of amalgamation; at the extraordinarily prolific character of the ground at great depths—a second and even a third "bottom" having been penetrated—it would be difficult to predict to what eminence this district may not yet attain as a seat of mining enterprise.

It was not until the opening up of Tarrangower, about the end of 1853, that any large migration marked a decline in the importance of Mount Alexander, hitherto the great centre of attraction.

The successful explorations of Capt. Mechosk and others, however, drew away considerable numbers, and from this period a succession of promising "rushes" followed each other at brief intervals.

Porcupine Flat was barely occupied before the wealth of the Trans-Loddon gold fields was disclosed, and the "sweet vale of Avoca" suddenly became the cynosure to which all eyes were directed. It again, however, was deserted for the auriferous spurs and flats which were found to intersect the wide sheep run held by Norman Simson—the present Maryborough-field. This discovery was followed by the opening up of the Creswick, Blackwood, Alma, Inkerman, and Fiery Creek diggings, during which period upwards of three-fourths of the mining class had crossed the Loddon and Bet-Bet, and had extended even as far as the Wimmera.*

Soon afterwards glowing reports came from across the Pacific, and the diggers in large numbers rapidly abandoned the *placers* of Victoria for the alleged discoveries in Peru. A *furore* for new fields had now set in, and successive stampedes to the Rocky River and other places of New South Wales, tended to a considerable thinning of the population. It was at this juncture that the importance of the Dunolly district became known, the wide leads of which, closely followed by the opening up of Chinaman's Flat, and in the ensuing winter of the extensive grounds of Ararat and Pleasant-creek, for some time afforded profitable employment to the miners.†

But with the great western fields the discoveries appeared to have terminated. A long period of inactivity followed, and migratory proclivities became general.

Towards the close of the winter of this year (1858) reports of the discovery of gold at Port Curtis, on the Eastern Coast, were circulated. These were listened to with eagerness by the miners, and the reported "finds" soon assumed the most attractive dimensions—pennyweights became ounces, ounces pounds, and so on even up to hundredweights. In a few weeks, notwithstanding the absence of any reliable information as to the value of the Canoona field, an exodus from the colony took place, only equalled in number by that of a more recent date to New Zealand. A magnificent country was explored, teeming with great natural wealth in the shape of a fertile soil, but possessing little auriferous value, and, but for the promptness of the Victorian Government, the "rush to Port Curtis" must have had a termination little less disastrous than that which attended the ill-advised expedition to Callao.

The depression of the mining interest in Victoria was, however, but temporary. Twelve months after the invasion of the Wimmera district fresh discoveries were made at Back Creek (Amherst), and the large area of productive ground opened up by the Talbot rush rapidly absorbed the unemployed. About this period, too, attention was first actively directed to the development of the quartz veins of the colony (hitherto subjected to the rudest method of operation) leading to the gradual discovery of the numerous rich gold bearing lodes distributed throughout the older diggings. The rush to Back Creek was followed by the opening up of Lamplough, and henceforward an almost uninterrupted succession of new fields greeted the miner. Old and New Inglewood, on the borders of the Murray Scrub, and Moonambel and Redbank, in the heart of the Pyrenees (the first celebrated for the number and value of its reefs), were closely followed by a considerable extension of the Burnt Creek diggings, the head-quarters of the Chinese in the Maryborough district.

Then came the more recent discoveries of Barkly, Landsborough, Navarre, Blue Mountain, Majorca, and Sebastian, the latest and most valuable being the Raywood field, in the Bendigo district.*

The management of the gold fields of the colony is placed under a Mining Department, the head of which has a seat in the Legislative Assembly and also in the Cabinet. The gold fields are divided into six districts (Ballarat, Sandhurst, Castlemaine, Maryborough, Beechworth, and Ararat), each of which contains numerous divisions, and has a mining board and a court of mines. The Mining Board consists of ten members, elected from the different divisions of the district, whose functions are to make bye-laws to regulate the working of the gold mines in its district. These bye-laws are carried into effect by the wardens, who are officers appointed by the Government to administer the general affairs of the gold fields. The warden adjudicates in cases of mining disputes; from him there is an appeal to the Court of Mines. This is an equity court, presided over by a judge appointed for the purpose, called Judge of the Court of Mines, and who is also generally a county court judge. Mining surveyors are also appointed by Government, whose duties are to receive applications for and register prospecting claims; to assist in the formation of streets and the laying out of business sites on new fields; to collect statistics showing the mining population, machinery in use, &c.; to survey and prepare maps of the mines; and generally to report to Government every month on all questions relating to mining in their respective divisions.

From the granting of licenses to dig on the 1st of September, 1851, to the end of the year 1863, the mines of Victoria have produced gold to the value of nearly 130 millions sterling, exported in the following yearly quantities (see Table, next page).

It will be seen from this table, that while the returns of the first six years averaged over 11½ millions sterling, those of the latter six years, terminating with 1863, averaged but 8½ millions annually—*primâ facie* evidence in favour of the supposition of a rapid deterioration of the gold fields.

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* During the Maryborough rush, several parties prosecuted a search for gold in the district of Lake Omeo, in the Mitta-Mitta ranges, and some of the northernmost spurs of Gipps Land, without any important results.

† A new field of some pretensions (Indigo) was also opened this year in the Ovens district, but was taken up principally by residents of the adjoining divisions to Beechworth, and by persons from over the Border.

* A number of minor fields were also opened, but call for no special notice. The older gold fields, such as Korong, McIntyres, Kingower, Rushworth, McIvor, Korong Moliagul, Burnt and Jones Creeks, were opened in 1852-3. There are in all upwards of eighty distinct "diggings" in Victoria.

Year.	Ascertained Produce of Victoria, exclusive of Gold taken away by private hand.*	Value of the Produce, rated at 80s. per ounce.
	oz. dwt. gr.	£
1851	145,146 14 16	580,587
1852	2,724,933 5 1	10,899,733
1853	3,150,020 14 16	12,600,083
1854	2,392,065 9 19	9,568,262
1855	2,793,065 8 16	11,172,261
1856	2,985,695 17 0	11,942,783
1857	2,761,528 8 0	11,046,113
1858	2,528,187 19 12	10,112,752
1859	2,280,675 13 0	9,122,702
1860	2,156,660 10 0	8,626,642
1861	2,244,452 0 0	8,977,808
1862	1,817,408 0 0	7,269,632
1863	1,634,377 0 0	6,537,508

In order, however, to arrive at any practical conclusions on this subject, it will be necessary to review the experience of the past few years.

The yield of gold reached its maximum with the opening up of Dunolly and Ararat (1856-7), at which time also the greatest number of European miners were engaged, but with the decline of the advantages held out during the earlier years (the last great rushes in point of yield and extent, being the Wimmera fields) a gradual decrease took place. Large numbers availed themselves of opportunities to quit digging for more congenial pursuits, generally those remaining who were best fitted for the labours and to whom gold mining became a regular occupation.

Nor must the fluctuation in the numbers of this latter class, principally due to the attractions of other fields, be overlooked. The late rushes to New South Wales and New Zealand, for instance, present a more satisfactory explanation of the decline of the gold crop of Victoria, than is to be found either in the assumed impoverishment of the diggings, or in the ordinary displacement of mining labour. Nearly one-fourth of the European miners (chiefly alluvial†) have been thus withdrawn in the course of the past few years. It may also be stated that at no time subsequent to 1858-9 has there been an accession of fresh labour to the mining population of sufficient importance to materially influence the amount of yield. The partial replacement of the numbers withdrawn, has been maintained principally by a steady reflux of the out-going element.

These repeated migrations to remote and, as experience has invariably shown, inferior fields, are highly characteristic of the gold-seeking class, to whom, perhaps more than to any other, "distance lends enchantment to the view."

Far from any failure of auriferous indications in Victoria, fresh discoveries continue to be made, while the gold-bearing rocks present themselves as permanent sources of supply.

The table in the next column will best illustrate the strength of the actual mining population during the past twelve years.

Although the richest deposits hitherto found in Victoria were struck in the grounds first opened (and which has strengthened the impression of the early exhaustion of our gold fields), it may fairly be questioned whether

* The amount of gold brought by hand from the gold fields to Melbourne, and taken away in passenger ships, without being passed through the customs, previous to the imposition of the export duty in 1855, has been estimated at 2,000,000 ounces. With this addition to the ascertained export of the precious metal we have a grand total of 126½ millions as the produce of the Victoria fields, or an average annual yield of better than 10¼ millions sterling.

† It is estimated that 70 per cent. of the total yield of gold is derived from alluvial mining.

Date.	Adult Miners, including Chinese.*	Total Population on the Gold Fields.
December, 1851	19,000	20,300
" 1852	33,000	44,400
" 1853	49,600	75,626
" 1854	62,250	92,853
" 1855	97,650	146,042
" 1856	110,500	181,000
" 1857	118,563	196,084
" 1858	126,685	205,320
" 1859	125,764	201,422
" 1860	118,562	224,977
" 1861	110,226	240,751
" 1862	99,742	234,202
" 1863	93,954	227,653

the real value of the later discoveries has been arrived at by the results obtained. For the purpose of illustration, we may compare the experience of this former period (at which time but little knowledge was possessed of the resources of the colony) with that of a later date. In the case of Mount Alexander, for instance, where the best yields were supposed to have been obtained with the least amount of labour, its development was gradual and continuous, extending over a period of two years or more.

Dating from the Trans-Loddon discoveries in 1854, the numerous fields successively opened (with perhaps one or two exceptions) have been "invaded" by a much larger body of miners than that which at any period thronged to those just quoted. The duration of a large rush rarely exceeding four or five months, a dispersion of the greater number will almost as rapidly ensue, the unsuccessful (necessarily a large proportion) betaking themselves to poor, but still remunerative fields—or, in mining parlance, "tucker" diggings—where they tide over the interval until the occurrence of another rush. Thus the large extent of country surrounding the productive centre is surrendered to what is really but a superficial examination; the practice of "shepherding," as pursued of late years, often preventing the development of what otherwise might prove to be rich and paying ground.†

It will be obvious, therefore, that the test of large areas, by operations thus systematically circumscribed, is utterly inadequate to determine their auriferous value, while the diversion of labour which necessarily attends a succession of "rushes," often widely separated, such as have occurred during the past few years, must operate prejudicially to the character of the yield.‡

(To be continued.)

* The numerical strength of the Chinese in Victoria may be stated at one-fourth of the total mining population. Their immigration into the colony commenced in 1853, and in the following year there were about 2,000 located therein; this number during the next three years increased to 30,000; in 1858 their numbers throughout the year averaged 35,000; in 1859, 42,000; and in 1860 again fell to 35,000; but the several attractions of Lambing Flat and Burrandong in New South Wales drew away 10,000 or 11,000 during this and the following years, leaving the population throughout the past two years, in round numbers, at 24,000.

† The important localities of Dunolly, Creswick, and Talbot, together with the Burnt and Fiery Creek diggings, had been at one time more or less abandoned, after a partial and hurried trial, while as evidence of the wealth which yet lies untouched in the midst of diggings rushed long ago, it is only necessary to refer to the recent discoveries at Raywood (Bendigo), and Majorca (Maryborough).

‡ Looking at the recent discoveries in different parts of the colony, and the steady increase in the number of miners returning from New Zealand, there is a reasonable probability that this year's produce of the gold fields will exhibit a considerable improvement upon that of later years respectively.

Fine Arts.

Picture Sales in Paris.—The last portion of the Piot sale exhibited some remarkable items; amongst others a portrait of Lord Chancellor Thomas More, by Hans Holbein the younger, seven inches in height, by about five in width, which brought £64. A series of sketches in Indian ink, heightened with white, by Meissonnier, of remarkable specimens of armour in the Musée d'Artillerie of Paris, fetched prices which show how great the reputation of this artist has become, one of these little sketches, that of a suit of engraved armour, designed by Jules Romain, having realized the sum of £80; the lowest figure obtained by these six drawings was £13 12s. At the same sale an ancient Greek bronze statuette, a figure of Agrippina, as Fortune, with a cornucopiæ in the left hand, fetched £240; and another small figure of Harpocratus, naked and leaning on the left elbow, with the index figure of the right hand on the lips, £128 16s. The former was found in the environs of Capua, about 30 years since, and formed part of the Teti collection; the latter formerly belonged to M. Duval, of Geneva, and afterwards to the late M. Louis Fould. A Greek statuette of the Plutus of Aristophanes, only six inches high, sold for £84. Three pictures by Diaz, "Scenes in the Forest of Bas-Bréau," fetched, at a sale the other day, £224.

Industrial Art Education in France.—The great efforts made of late in England to inculcate a knowledge and teach the elements of industrial art have caused the French government to look to its laurels, and to devise new methods of art education, and it has also given rise to several associations for that object. One of these, "La Société du Progrèss de l'Art Industriel," which has for its president M. Viollet-le-Duc, the architect, has just appointed a commission to draw up a working plan for a Museum of Industrial Art, with galleries for permanent exhibition, sale-rooms, lecture-theatres, and library in the centre of Paris, and has issued an appeal to those interested in such matters for aid and advice.

The Exhibition of the Works of Living Artists in Paris.—An analysis of the list of artists to whom medals have been awarded by the jury this year shows that of the painters thus distinguished 34 are French, 2 German, 2 Italian, 1 Belgian, and 1 Dutch; of sculptors, 13 are French, 1 Belgian, and 1 Prussian; in architecture all are French; and in engraving 6 are French, 1 Danish, and 1 German. There are amongst the exhibitors, English, Americans, Swedes, and others, but none of these have obtained a medal. The "Battle of Solferino," by Meissonnier, which is one of the gems of the exhibition, and which was painted by order of the Emperor, is to be placed in the gallery of the Luxembourg. The destination of the companion picture, by the same artist, "Napoleon in 1814," does not seem to be decided. They are both very extraordinary productions, giving effects on about two square feet of canvas which few artists have succeeded in producing on the largest scale. On a recent Sunday, when the exhibition was open to the public gratis, 22,000 visitors passed the wickets.

Commerce.

WASTE OF COAL.

By P. L. Simmonds.

The large demands now made upon our collieries, and the extending use of coal, should lead to a more thrifty system of working; and it is satisfactory to find that this subject, of the great waste of coal, has lately been occupying attention in many influential quarters. Rich as our stores of mineral fuel are, they should be worked and husbanded with care, for we are told on authority that the time is not remote when we shall have to encounter the disadvantages of increased cost of working and diminished value of produce. The quantity of coal yearly worked from British mines has been almost trebled during the last twenty years, and has probably increased ten-fold since the commencement of the present century; but as this increase has taken place pending the introduction of steam navigation and railway transit, and under exceptional conditions of manufacturing development, it would be too much to assume that it will continue to advance with equal rapidity.

Mr. Robert Hunt tells us that the amount of coal raised in 1863 was more than 83½ million tons. The demand for fuel and for the condensation of steam, in our dwellings, factories, locomotives, and steam-vessels, is daily becoming more extensive, while eight million tons a year are now exported.

Mr. Hunt, in his "Mineral Statistics of the United Kingdom, for 1861," also informs us that two millions and a half of tons were wasted in that year in the process of working and burnt at the surface, in the collieries of Durham and Northumberland only. The total waste must, therefore, have been very large, although information thereof cannot be correctly obtained.

The late Dr. Buckland, in an address delivered to the Geological Society, in 1841, called attention to the wanton waste which for more than fifty years had been committed by the coal owners near Newcastle, by screening and burning annually, in never-extinguished fire heaps at the pit's mouth, more than one million chaldrons of excellent small coal, being nearly one-third of the entire produce of the best coal-mines in England. This criminal destruction of the elements of our natural industry, which is accelerating by one-third the not very distant period when these coal-mines will be exhausted, is perpetrated by the colliers for the purpose of selling the remaining two-thirds at a greater profit than they would derive by the sale of the entire bulk unscreened to the coal-merchant.

Sir W. Armstrong, the president of the last meeting of the British Association, dwelt very strongly upon this subject. "Were we (he said) reaping the full advantage of all the coal we burn, no objection could be made to the largeness of the quantity, but we are using it wastefully and extravagantly in all its applications. It is probable that fully one-fourth of the entire quantity of coals raised from our mines is used in the production of heat for inactive powers, but the average quantity of coal which we expend in realising a given effort by means of the steam-engine is about thirty times greater than would be requisite with an absolutely perfect heating engine.

"In those applications which are generally of a metallurgical nature the same wasteful expenditure of fuel is everywhere observable. In an ordinary furnace, employed to fuse or soften any solid substance, it is the excess of the heat of combustion over the body heated which alone is rendered available for the purpose intended. The rest of the heat, which in many instances constitutes by far the greatest proportion of the whole, is allowed to escape uselessly into the chimney. The combustion also in common furnaces is so imperfect, that clouds of powdered carbon, in the form of smoke, envelope our manufacturing towns; and gases, which ought to be completely oxygenised in the fire, pass into the air with two-thirds of their heating power undeveloped. Not less wasteful and extravagant is our mode of employing coal for domestic purposes. It is computed (adds Sir W. Armstrong) that the consumption of coal in dwelling houses amounts in this country to a ton per head per annum on the entire population, so that upwards of thirty millions of tons are annually expended in Great Britain alone for domestic use. If any one will consider that one pound of coal applied to a well-constructed steam-engine boiler evaporates ten pounds, or one gallon of water, and if he will compare this effect with the insignificant quantity of

water which can be boiled off in steam by a pound of coal consumed in an ordinary kitchen fire, he will be able to appreciate the enormous waste which takes place by the common method of burning coal for ordinary purposes. The simplest arrangements to confine the heat and concentrate it upon the operation to be performed would suffice to obviate this reprehensible waste. So also in warming houses, we consume in our open fires about five times as much coal as will produce the same heating effect when burnt in a close and properly-constructed stove. Without sacrificing the luxury of a visible fire, it would be easy, by attending to the principles of radiation and convection, to render available the greater part of the heat which is now improvidently discharged into the chimney."

In my work on "Waste Products," a year ago, I called attention to this subject, when I stated that "An immense amount of coal is wasted at coal mines by the process of breaking up the coal into the proper size for market. In this operation a large percentage of the coal is finely pulverised, and is thrown aside as unsaleable. This fine and wasted coal is of the purest quality. A correspondent of the *New York World*, writing from the Pennsylvania coal mines, states that at a single colliery, doing a good business, 400 tons of coal per day are made to pass through the machines for breaking up the lumps, and the waste is about 20 per cent., or 80 tons daily. All this amount has to be mined, brought to the breaker (two iron cylinders, with iron teeth, revolving in a horizontal position, parallel to each other, and about 10 in. apart), and, after this process of destruction, has to be carried away and piled up. One may see at any colliery, of several years' standing, enormous quantities of this now worthless article; very pyramids. All this, except what little is made in the mines by blasting, has to be paid for by the operator, and is a loss to the owner of the land, as well as the human family, and adds price to that which the consumer buys in the market. The waste in the collieries in Schuykill and Luzerne counties, Pennsylvania, is believed to be over one million tons annually, worth £1,000,000. A small kind of coal, called Burgie, is used in this country for burning in engines. Coal dust or slack ground in a mill is manufactured in the districts of Manchester, Wigan, Rainhill, &c., and used by iron-founders exclusively for the mould. Burgie, the dust coal of the mines and screenings from house coal, is in Wales and other parts pressed into cakes of artificial fuel. Warlich's patent fuel consists of bricks made by compressing with an hydraulic press dust of coal, rendered coherent by bituminous matter, and partly charred. These bricks measure 9 by 6½ and 5 in., are dense, and require breaking before using. They burn with but little smoke, and form an excellent fuel, particularly where economy of room is an object, as they can be stowed very compactly. In many collieries no important use has yet been made of the dust coal. By similar treatment every pound of it might be saved, with a good profit to the manufacturer."

Whoever, observes Professor Booth (Smithsonian Report), witnesses the enormous amount of fine coal thrown in heaps near the anthracite mines, and allowed to be washed away by streams, must have regretted the waste of a quantity of fuel which will never be recovered. Many patents have been taken out in England with the view of saving fine culm, by mixing it with adhesive combustibles, such as coal-tar, &c., and pressing it into blocks. One patent proposes mixing dried and ground spent tan with rosin oil, and compressing into blocks. Another patent uses also refuse tan and peat with coal-tar, &c. But all these processes would seem to be ineffectual at the American anthracite mines, because not sufficiently economical in comparison with the price of coal. It is to be hoped that a process will yet be devised by which the fine dust and waste may be rendered equal in value to the pure anthracite, or even superior to it for some purposes where more flame is required. The use of plaster and other like cement to unite fine coal into blocks or masses for fuel, as proposed by Hollands and Whittaker (in 1849), is objectionable, since it does not "add fuel to the fire," but ten per cent. ashes, in addition to the large amount of ash usually in fine culm.

It was recently stated at the Dudley and Midland Geological Society, by Mr. Rupert Kettle, the chairman, that by the improper working of the thick coal measures, only one-half of all sorts (coals, lumps, kibbles, and slack) were brought to the surface applicable for the purposes of use and sale. Thus an acre of thick coal, on the principle of working now adopted, is worth only £6,000, whereas, if the 36,300 tons were in the same shape as the 18,000 tons, it would produce £13,100. The same theory carried out in respect of the thinner measures would lead to the result that though a larger proportion of coal was brought out of those measures than out of thick coal, still the actual portion remaining in the earth, in comparison with the quantity brought to daylight, is so great that it is worth every attention that can be bestowed upon it, so that its working may be more economically effected.

Many of the inferior seams of coal can be worked only in conjunction with those of superior quality, and they will be entirely lost if neglected until the choice beds be exhausted. Although coal is private property, it was well observed by Sir W. Armstrong, that its duration is a national question, and Government interference would be justified to enforce such modes of working as the national interests demand.

The question is not how long our coal will endure before absolute exhaustion is effected, but how long will those particular coal seams last which yield coal of a quality and at a price to enable this country to maintain her present supremacy in manufacturing industry.

DANISH IMPORTS AND EXPORTS.—The imports into the United Kingdom from Denmark consist almost entirely of raw produce and consumable articles, the chief of which are butter, cattle, corn, oil seed cake, rapeseed, and sheeps' wool, the aggregate value in the year 1863 having amounted to £2,429,513. Compared with the aggregate of 1862, this return is larger by £264,473, although much less than the annual average of the last ten years. In 1862 there was a decrease in the importation of wheat of about 45 per cent., the value in that year having been £375,459, while in 1861 it amounted to £641,484. Butter, on the other hand, which in 1859 was imported to the value of £15,849; in 1860 of £49,351; in 1861 of £105,379, increased in 1862 to the value of £171,882. With the exception of hides, oilseed cakes, and salted pork, which exhibit considerable diminutions, the other commodities possess no noteworthy feature. The exports of British produce and manufactures to Denmark show a progressive increase since the year 1858, when their real value was £595,309. In the following year they increased to £723,978; in 1860 to £731,267; in 1861 to £912,807; in 1862 to the value of £941,771, and in 1863 to £1,005,321. The most prominent items in the list comprise coals, iron, cottons, and cotton yarn, linen and woollen manufactures. Of foreign and colonial produce exported the value averages about £200,000 annually, and consists mostly of coffee, cotton, indigo, sugar, tea, and wine. The number of Danish ships which entered the ports of the United Kingdom in 1863, was 2,871, with an aggregate measurement of 278,338 tons, an increase on the previous year of 237 ships and 21,416 tons.

IMPORTATION OF CATTLE.—A considerable augmentation in the importation of cattle, &c., took place in the first three months of this year. Of oxen, bulls, and cows the number was 13,134, or 5,748 more than were imported in they corresponding period of last year, 1863; of calves, 3,634, an increase of 465; of sheep and lambs, 34,690, an increase of 10,765, and of 2,067, being 1,768 in excess of the number in the first quarter of last year.

Colonies.

QUEENSLAND. — POPULATION, REVENUE, &c. — The recent census shows the effects of the immigration which has prevailed during the last year or two. Taking, for instance, the towns of Brisbane and Ipswich, the comparative numbers are as follows:—

	Males.	Females.	Total.
On the 7th April, 1861.			
Brisbane	3179	2872	6051
Ipswich	1667	1620	3287
On the 1st January, 1864.			
Brisbane	6347	6052	12399
Ipswich	2292	2153	4445

These figures represent the inhabitants of the town portion of the police district of each place. It will thus be seen that in nearly three years the population of the capital of the country has been doubled; at the same time it must be borne in mind that the majority of the immigrants from Europe are scattered over the country districts. The revenue from all sources for the year 1863 was £309,112 8s. 9d., being an increase of £13,826 8s. on that for 1862. This increase does not bear such a high proportion to the total amount, nor is it nearly so much as that of preceding years, in which the revenue collected was as follows:—1862, £295,286; 1861, £238,303; 1860, £178,589. The revenue falls short of the estimates of two finance ministers. In May, 1862, Mr. Mackenzie, the first Colonial treasurer, estimated the revenue for 1863 at £317,200; in August last Mr. Moffatt, the present treasurer, estimated it at £350,000, exclusive of land orders. The revenue is, however, on the whole satisfactory. The customs receipts exhibit an increase of £29,091, the total amount for the year being £125,199; nearly two-thirds of this large sum was derived from spirits, wine, ale, porter, and beer of all sorts, in connection with which may also be specified the receipt of £8,179 for licenses to sell those liquors. That the commercial relations of the colony with other countries are rapidly increasing is unmistakably evidenced by the large increase realised from postage, £11,481; pilotage, harbour dues and fees, £2,260; and electric telegraph receipts, £4,120. It is under the head of land revenue that a serious falling off is seen. The total proceeds of the land sales during the year is set down at £135,614, less land orders £95,607; in other words, the actual cash payments into the treasury for lands purchased was £40,007, or £19,374 less than in 1862. In thus dealing with the land orders a large question for discussion is opened up. If the value of the land orders were included as receipts, the revenue for the year would appear as £404,720. The receipts from rents of land, assessment on runs, and surveys of runs, the only other items of land revenue, exceed by £5,762 those of the preceding year.—A Brisbane paper says that information of the highest importance, as affecting the future commercial interests of Queensland, has recently come to hand from the East Indian Archipelago. It is the proposed establishment, by the Dutch, of regular steam communication between Batavia, the seat of the general government of Netherlands India, and the several settlements of that nation in the Java and China seas, and the important British settlement of Singapore. The scheme is one of great magnitude, embracing not less than six main lines of steamers, irrespective of the branch lines connected with them. It is said the company have undertaken to procure from England a fleet of new steamers for the service, and that the Government have granted an annual subsidy of £30,000 during the term of the contract; and further, that they have advanced to the company the sum of £100,000, without interest, to enable them to enter upon the work with abundant means to secure success. The arrangements are proposed to fit in with those of the Peninsular and Oriental Company, whose steamers to and from China can be met with at Singapore. It is said that the Indian press is unanimous in its approval of the scheme, and that speculations have been advanced that it will, above all things, be calculated to open a traffic with the new settlements that are to be established in North Australia. None of the colonists of Queensland are satisfied with the way in which the mails are conveyed to and from England. A material amendment is looked for in the northern route, in connection with the Dutch lines, supposing these lines were in working order.

GOLD.—A Sydney paper says:—"The quantity of gold delivered from the several gold fields, during the month of December, 1863, amounted to 28,226 ounces. For the corresponding month of 1862, the receipts reached 29,843 ounces. There is, therefore, a decrease on the month of 1,617 ounces, or about $5\frac{1}{2}$ per cent. During the year ended 31st December, 1863, the amount of gold received has been 422,722 ounces, against 584,219 ounces in 1862. The decrease on the year is therefore 161,497 ounces, or 26 per cent. The falling off in the yield from the gold-fields is easily traced to the small quantities which have been received throughout the year from the Lachlan and Burrangong gold-fields. From the minor gold-fields, however, the receipts are up to the average, and in some districts, viz., Bathurst, Orange, and Stoney Creek, and the Northern gold-fields there is an increase in the quantity forwarded by escort. There is a decrease in the quantity of gold received from the Western gold-fields of 110,741 ounces, or 34 per cent.; and from the Southern, 60,200 ounces, or 26 per cent.; but from the Northern there is an increase of 9,444 ounces, or 35 per cent. Although during the past year the quantity of gold received is considerably below the year 1862, still there is a large increase on the receipts of the preceding years—the increase on the year 1861 being over 19,000 ounces, and in the year 1860, 67,000 ounces. The increase on 1853 is 250,000, and on 1856 nearly 290,000 ounces. Since the year of the gold discovery, 1851, the smallest amount of gold was received in 1855, when the average amount was 2,016 ounces per week, and the largest was in 1862, when the average reached 11,234 ounces per week."

NEW SOUTH WALES REVENUE.—The heads of revenue which show an increase are Customs duty on refined sugar and molasses, duty on spirits distilled in the colony, postage, licenses, fees of offices, fines and forfeitures, rents (exclusive of land), railways, electric telegraph receipts, pilotage rates and harbour dues, tonnage dues (Newcastle), rates under Chinese Act, commission on money orders, and miscellaneous receipts, and amount altogether to £119,455 3s. 6d. On the other hand there is a decrease in the revenue derived from gold, mint receipts, land revenue, interest on city debentures, amounting altogether to £176,819 17s. The decrease in the revenue is, therefore, to be attributed to the considerable falling off in the land revenue of £45,500, and in the gold and mint receipts of £52,700. The decrease is also swelled by the amount received in 1862 as interest on city debentures, and which was £48,261 14s. 6d. more than in 1863. It is satisfactory, however, to find that the customs revenue shows a slight increase of about £7,400, and this, together with the duty on refined sugar and molasses (which is placed under a separate head), makes the increase on dutiable articles amount to £22,000. On the duty on spirits distilled in the colony the amount received in 1862 and 1863 are about the same, the increase being only £7 14s. The receipts from railways and electric telegraphs show a marked improvement on the year 1862—the increase in the former being £33,747 18s., and in the latter £8,464 7s. The decrease and increase on the other heads of revenue are unimportant. The special receipts collected during the year 1863 amounted to £48,745 1s. 4d., against £41,858 17s. 8d. in 1862, being an increase of £6,886 3s. 8d.

SYDNEY EXHIBITION.—The medals awarded at the preliminary exhibition in Sydney, of articles that were intended for the International Exhibition of 1862, have been struck off at the Sydney Mint, and have since been

claimed by their respective owners. In addition to the silver and bronze medals, which already number 120, three medals have been struck in gold, to be presented respectively to Messrs. Carr and Company, Messrs. Gott and Company, and the Bradford Exhibition Committee, in acknowledgment of the presents of several elegant shawls and other fabrics manufactured from the wools of the colony. The medal is of pure gold, and weighs about $11\frac{1}{2}$ oz., its value being nearly £50. The silver medals were made almost entirely of colonial silver, extracted from the gold brought to the Mint for coinage. One of the medals has been awarded to each of the local commissioners for their services.

The Sydney Money Market has been rather tighter. This is probably caused by the amount that has lately been called up by those companies which have increased their capital, and also by the fact that there are other new companies, viz., the Bank of New South Wales and Hunter River New Steam Navigation Company, which intend to increase their capital. The amount required for this purpose is very large, and must for a time cause some demand for money. Besides this, debentures for a large amount have been issued by several companies, and there is also the possibility of the government stepping in at any moment with Treasury bills to the amount of £400,000. These facts are, therefore, sufficient to enhance the value of money for the present. The rates of discount charged by the banks still range from 7 to 10 per cent.

Agricultural Distress in New South Wales.—The smaller class of agriculturists in the counties of Cumberland and Camden have been reduced, by the loss of their wheat crop, in consequence of drought and rust, to a condition of comparative destitution. Three years since the crops in many places were destroyed by hailstones of unusual violence. The harvest of 1862 was lost from drought, and the wheat crop of 1863 was destroyed by rust. A very large and industrious class of the population has thus been placed in a position of great suffering. Last year the government came to their relief with about twenty thousand pounds worth of seed wheat and oats on loan. It was hoped that a good harvest would enable the struggling people to repay the advances thus made. This hope, however, has not been realised, and the people are now in a worse position than when they received the public loan. Meetings have been held, ostensibly with the view of asking that the government claim for repayment may be deferred, but, in reality, to bring the condition of the distressed farmers prominently before the public.

Coal Oil.—A private letter from Gaspe states that this product is supposed to exist in large quantities in that locality, but has not yet been tapped. Those engaged in boring for it have left off at over 700 feet without finding more than indications of its presence, and have begun boring in another place, hoping to strike upon it at a less depth.

Natal Sugar.—The year's crop is estimated to be not far short of 3,000 tons. The yield has been generally satisfactory. On very few estates less than a ton per acre has been averaged. On many two tons have been obtained, and several fields are cited as having yielded fully three tons per acre.

Obituary.

Dr. Normandy, long known as a practical chemist and an experimental philosopher, died on the 10th instant, in the 54th year of his age. He was a Frenchman by birth, but resided in England. Originally educated for a surgeon, he passed the necessary examinations, but having in the course of his studies been led into chemical experiments, he found a greater attraction in their pursuit. While so occupied he formed an intimate friendship with the late Dr. Ure, with whom he was subsequently associated in many important chemical investigations, and he became well known for his chemical acquirements. Dr. Normandy was the author of several works, amongst which may be mentioned "An introduction to Rose's Chemistry" (he also edited an English translation of that work); "The Handbook of Chemistry;" "A Treatise on Agricultural Chemistry;" "Guide to the Alkalimetrical Chest;" "The Chemical Atlas," a work of great value to students of chemical analysis;" "The Dictionary of the Chemical Atlas." He also contributed to the new edition of Dr. Ure's "Dictionary of the Arts and Manufactures." He was the inventor of a very successful apparatus for use on shipboard, for distilling fresh water from salt water.

Publications Issued.

The Exhibited Machinery of 1862; a cyclopædia of the machinery represented at the International Exhibition, by D. K. Clark, C.E., M. Inst. C.E., late Superintendent of the Western Annex, International Exhibition, 1862, &c. (*Day and Son.*) This book has been written for the purpose of supplying a descriptive and critical analysis of the machinery exhibited at South Kensington in 1862. The descriptive particulars are, for the most part, based upon the observations of the author, who, as Superintendent of the Machinery Department, had frequent opportunities of examining the machinery. In addition, he has availed himself of the co-operation of exhibitors in verifying and authenticating the descriptive matter of this work, to whom, in the majority of instances, proofs for that purpose were submitted, and these gentlemen willingly responded to the author's applications. Upwards of eleven hundred machines and portions of machines have thus been accurately noticed, or described in detail, so that, in fact, the work constitutes a compact Cyclopædia of Machinery, valuable as a text-book for students, and as a work of reference for engineers. In the arrangement of this work, the author has, in general, followed the classification of machinery adopted by Her Majesty's Commissioners for the International Exhibition, and comprehended in the official Industrial Catalogue. Part I., on Railway Plant, embraces the contents of what has been known as Class 5. Part II., on the Machinery for Manufacturing Textile Fabrics, embodies the contents of Class 7*a*. Part III., on the Manufacturing Machines and Tools for Working in Iron, Wood, and other materials, relates to the contents of Class 7*b*. Part IV., on Machinery in General, to the contents of Class 8. With every disposition to compress the matter of this volume within smaller limits, it has, nevertheless, been extended to nearly one-half more than the space originally assigned for it, as it was found that those limits could not be observed without injuriously curtailing the book. In fact, the volume might easily and profitably have been extended to double the size. The wood-cuts and plate-engravings, which are very numerous, will be found of great utility in illustrating the text. The Plan of the Western Annex shows the arrangement of the machinery department as prepared and carried out by the author for Her Majesty's Commissioners; it will possess considerable interest, particularly for those who were identified or associated with that department. The drawing from which the plan has been reduced, was carefully made for the author by Mr. John Cundy, Deputy-Superintendent of the Annex. A number of machines were drafted to the Eastern Annex, for want of space in the Western, which accounts for the absence of these machines from the plan.

Farming in India, by Lieut.-Col. Greenaway, of the Madras Staff Corps. (*Smith, Elder, and Co.*) This work is intended especially for those Europeans of a superior class who purpose taking up farming in India as a pursuit. It embodies the experience of an intelligent officer in the Indian service, who, on his return to England, was much

struck with the want of accurate information on Indian subjects, more especially those connected with that country as a field for the enterprise of European settlers. He found, by the objections commonly raised, that the subject was not understood, and was obscured by prejudices and various notions, which there was no accessible information to correct. Hence this book, which briefly and plainly communicates facts upon such points of Indian living and Indian farming as an intending settler should thoroughly understand before making up his mind to embark himself and his capital upon such pursuits. It gives minute information on the construction of buildings, reservoirs, irrigation and drainage works,—matters of vital importance to the Indian farmer, and which, in ninety-nine cases out of a hundred, he will have to see to himself. The work is comprised in twelve chapters, treating respectively of the land and climate of India, the character of the natives, the causes of the failure of Europeans, a general view of Indian farming, wet farming, irrigation, and drainage; dry farming, hill farming, buildings, plant, and machinery; live stock, farm servants, and the author's *resume* and conclusions. The work is illustrated with plans for the construction of drains, tanks, weirs, sluices, and is contained in 132 pages.

OYSTER FISHERY (*Alexander Thom*, Dublin, for Her Majesty's Stationery Offices).—This work has been compiled and published with the sanction of the Commissioners of Public Works, for the information of persons interested in oyster-fisheries, and contains the laws which regulate the oyster-fishery and cultivation in Ireland, showing the capabilities of that country and the means of overcoming natural difficulties in connection with the propagation and growth of the oyster, being chiefly a reprint of articles from various sources of information. The object is to diffuse a practical knowledge of the means whereby oysters may be most abundantly produced in the best marketable condition, and the oyster-fishery developed to the extent demanded by its importance as an abundant source of food and employment. The best available authorities have been cited, and the opinions of persons who have given the subject the greatest consideration have been printed, without comment or addition, so that the statements made rest entirely upon the authority of the respective writers. Copious extracts are given from the able pamphlets of Dr. Kemmerer, of the Isle of Ré, and the admirable and exhaustive work of M. Coste, "Voyage d'Exploration," from which the illustrations have been chiefly adopted; and obligations are also due to Mr. Thomas Ashworth for many valuable communications.

Notes.

ALEXANDRA PARK.—A correspondent writes:—"This undertaking bids fair soon to add another boon to the hardworking artizan, and to offer him an 'outing' of a truly country character, for the elevation which forms the site is tufted in all directions with beautiful trees, especially oak, and there is no intention of felling any of them, or of cutting the sward up into gardens as at the Crystal Palace, so that he and his children may roll on the grass and 'lie under the greenwood tree' to perfection, while materfamilias looks on in quiet complacency. The top of the hill is now being levelled into a spacious platform, on which the palace itself is to rise, and from which a magnificent and varied view offers itself in all directions, the great city being in the distance, over which may be seen the rural glistening beauties of the Crystal Palace, and all round some of England's loveliest scenery. It is no venture to say this, for while from this principal hill scenery is presented similar to that from Richmond or Leith hill, in Surrey, one needs but descend a little valley and rise again to another smaller hill, also the property of the company, to find oneself in a spot fully wooded, on a steep descent, so retired and luxuriant, and bold in its slope, that it is more like Devonshire than the neighbourhood of London, insomuch that one almost expects to see a rattling trout or salmon river through the underwood in the gorge below. These, however, are features not to be transplanted, but instead of them, in descending again one comes on a fine race-course, every point of which can be distinguished from the principal hill, which, on such occasions, will afford a grand-stand for the million. Besides this there is a good cricket ground. Various lesser buildings are rising in the grounds, but the first column of the principal edifice is not to be raised till next month. The park is easily accessible from Farringdon-street to the Wood-end station on the Great Northern line, which runs at the foot of the hill, but the intention is eventually that railway communication should reach the palace itself, on the top of the hill, and this not from one quarter alone but from several. A fine and liberal feature of the plan is the cheapness at which this holiday boon is to be offered to the poorer public, while to the richer, Grove-house and its grounds, on the neighbouring hill, will afford those refinements of selection they desire, among which will be the creature comforts of an excellent restaurant. At present the estate is quite a country place, full of butter-cups, birds, and timber trees, and so it is to be left, with the addition of one spacious and other lesser buildings, and the various arrangements for exercise and sport which the promoters of the undertaking intend to provide for the active and merry tastes of the public, without interfering with the present rural character of the grounds."

NORTH LONDON WORKING CLASSES INDUSTRIAL EXHIBITION.—On Tuesday, 23rd May, a public meeting was held in St. Bartholomew's Schoolroom, Hayes-place, Lower-road, Islington, for the purpose of adopting measures for getting up a working classes industrial exhibition for North London. The meeting was presided over by Mr. William Harvey. Mr. Lovell, sen., the hon. secretary, read a statement setting forth the objects of the exhibition and the steps which had been already taken to carry it out. Seeing the success which had attended an exhibition of a similar character in South London, which was opened during last March, several persons in the northern districts of the metropolis had conceived the idea of attempting one of a like nature, where the working men in these districts might exhibit the products of their skill and ingenuity. A preliminary committee had been appointed, who had taken up the matter in a most cordial manner; and, in order to place it fairly before the working classes, they had convened the present meeting. The exhibition would consist of articles of utility and art, the production of working men, and the rules which had been framed for carrying out the arrangements were generally similar to those which had regulated the South London Exhibition. Resolutions to the effect that the scheme for promoting an industrial exhibition for the North of London deserved the hearty co-operation of all classes, and that the meeting pledged itself to support, by every means in its power, the establishment of such an exhibition, were carried unanimously.

NEW SCIENTIFIC ASSOCIATIONS IN FRANCE.—Much has been done of late in France towards the furtherance of pure and industrial art by means of private enterprise. Several associations are now in active operation, and others are being carried into effect. It is a greater novelty to see the same principle applied to abstract science. The scientific, like the artistic world, has been roused to the truth that the state is incompetent to supply all that is demanded by the spirit of discovery, and the former, like the latter, has determined to test the value of independent enterprise. M. Leverrier, the Imperial astronomer, proposed, some time since, to found, with the assistance of the official visitors of the observatory, a grand prize in meteorology, and issued a circular letter to the scientific world on the subject, which seems to have received an encouraging reply, for the

same gentleman has now set on foot an association for the advancement of astronomical and meteorological science in general. The scheme is drawn on a grand scale, and this will probably ensure its success. A large number of scientific men were consulted on the proposition in question, and this consultative body—consisting of members of the Institut, of the Meteorological Society, professors of the Observatory, scientific writers, medical, and other scientific men—has given its positive adhesion to the scheme. The fundamental laws of the association have been drawn up by this body, and the new association may be looked upon as launched. The authorities have sanctioned it, and the "Association for the Advancement of Astronomy and Meteorology" is now an existing fact. The society is at present governed by a provisional committee numbering about fifty persons. Its mission is, not to discuss or study science itself, but to encourage others in that study by furnishing the necessary instruments for that object, and also by the moral force of its united members as well as by the material power of its subscribed capital. In order to open the doors of the association as wide as possible, and to give to it the widest and firmest basis, it will not only have a list of regular subscribing members, but will admit the public to its meetings at a fixed rate. The annual subscription of the former is fixed, for the present, at the very low rate of ten francs a year, and the admission to each sitting at two francs per visitor. The association has its rooms at the Imperial Observatory, and an office at the Meteorological Society, in the Rue Fleurus, and the founders express the fullest confidence in the success of the undertaking. The first operations of the new association are already planned out. The laws of meteorology are yet to be evolved, and with the view to stimulate inquiry, with this end in view, a grand prize is to be founded. A committee is now sitting to determine upon the conditions and the amount of this prize. As to astronomy, the grand necessity recognised by the association is the construction of instruments of high power; the materials and the principles of construction are ready, the means alone are wanting. It is considered eminently desirable that observers, with good instruments, should be established in all directions, especially under the clear sky of the south, and therefore the association has at once voted a sum of 50,000 francs, for its portion of the cost of production of a telescope with an opening of 75 centimètres, or 29·5 inches English. The society also undertakes to obtain from the authorities of the town where this instrument is to be set up, a further portion of the amount of the cost, and it is expected that the State itself will also lend its aid.

Patent Office Library and Museum.—Mr. Dillwyn has moved for in the House of Commons, and obtained a committee to inquire into the condition of the Patent Office Library and Museum. The names of the committee are as follows:—Mr. Dillwyn, Mr. Cowper, Mr. Gregory, Mr. Knight, Lord Robert Cecil, Lord Henry Lennox, Mr. Ayrton, Mr. Augustus Smith, Lord Elcho, Mr. Waldron, Mr. Adderley, Mr. Walter, Mr. Calthorpe, Mr. Holford, and Mr. Francis Sharp Powell.

Drainage of the Metropolis.—The engineer of the Metropolitan Board of Works has reported that at the present time about one-sixth of the metropolitan sewage is intercepted by the northern outfall sewer works, and discharged into the Thames at ebb tide at Barking, whence it is carried to the sea. This sewage, about 14 million gallons in quantity, has hitherto been discharged into the river Thames at low water, within the limits of the metropolis.

Correspondence.

Labourers' Cottages.—Sir,—The difficulty as to the provision of cottages for labourers at a price to be mutually advantageous, does not appear to have been solved by the recent discussion, nor by the numerous designs in competition for Mr. Denton's prize. This is owing to too much being expected. According to several, if not most of the plans, the labourer is to be provided with pantry, scullery, and, in some cases, with bakehouse. In the estimates for the selected designs I observed about £20 for plumber's work. These are unnecessary obstacles. The chief object is, or should be, to provide a comfortable sitting-room, with, for families, three bed-rooms, and this may be gained, at a comparatively small cost, by a cottage of four rooms, with a lean-to for scullery purposes, washing, &c. The upper floor should be two bed-rooms, front and back, the lower floor a sitting- room and bed-room. All cooking, including baking, may be done by a good range with oven, which is economical of fuel, such as Sir Thomas Dyke Acland, has provided for his cottage tenants in the neighbourhood of Broad Clist. The lean-to might contain fuel, with a sink for washing, and with an earthen or iron tank, or tub, with iron fall-pipes for rain water. The plumber's bill should be very little. Any other water supply might be for a row of cottages in common. It is much better to be content with moderate improvements that are practicable, because they may be commercially successful, than, by striving for more that if possible would be desirable, really obtain less. In Leeds there is a small society which purchases a plot of land, builds, on the best terms it can, a block or row of cottages; these, when finished, are offered to working men at cost price, house and land freehold, a portion to be paid by the purchaser, and the remainder by the Leeds Permanent Building Society. The latter is reimbursed by a weekly rent, payable for about thirteen years, at the expiration of which the house and land become the freehold of the working-man. Such a system is not practicable in rural districts, but is worth attention in towns. As each row of houses has been sold, or nearly so, another is commenced, and the society has already erected nearly a hundred comfortable and commodious cottages.—Barnett Blake.

Barometers.—Sir,—In your *Journal* of the 1st of April appears a description of a so-called new barometer, which, I think, will be found accurately described in the following extract from the *Encyclopædia Britannica*, 7th edition, 1842, and written by Sir J. Leslie:—"The most accurate construction of a barometer of this kind [the conical barometer, invented by Amontons, 1695] is attained by joining together two tubes that have even but unequal bores, the longer and narrower being uppermost. If the width of the upper tube were supposed to be, to that of the under one, as two to three, the scale would be enlarged three times, since, by descending three inches from the top, and, consequently, two at the bottom, the column would suffer a contraction of one inch in height. This species of barometer is thus recommended by its simplicity and its ample range. But the bore of the tube being indispensably small, the mercury moves with difficulty, and resists impressions of minute changes of external action." Also, page 400—"A modification of the conical barometer in travelling we have ourselves employed. The principal part consists of a small steel stopcock, a glass tube 31 or 32 inches long, with a bore of the tenth of an inch, sealed at top and filled with quicksilver, is cemented into the one end of the stopcock, and into the other end is cemented an open and wider tube, 16 inches or more in length, and having its diameter above the eighth of an inch. This compound tube is lodged in a walking-stick, divided into inches and tenths through its whole extent, or only at the upper part." It will thus be seen that this barometer was invented and published more than 20 years since, and, if necessary, I could mention persons, both in London and elsewhere, who have made them, but probably they have not been much used, from the defect alluded to, which cannot be got rid of, except by using a larger tube, and having a moveable piston in the bottom, on Whiting's plan, as exhibited by Mr. Becker last year at the soirée of the

Royal Society. Mr. Becker informed me, and, no doubt, others as well, that Whiting had also made them, as described above, with the small tube. Mr. Becker's instrument led, no doubt, to the recent revival of this kind of barometer; but while, perhaps, as a matter of business, it may be thought legitimate for any maker to introduce, in connection with his own name, an instrument not generally known in the trade, it was hardly to be anticipated that the Royal Society should lend the sanction of their authority to the introduction of an instrument as new which was published more than twenty years since in a by no means obscure work. The above quotations appear also in the eighth edition of the *Enclycopœdia.*—I am, &c., W. SYMONS.

VIBRATION IN STEAMERS.—SIR,—It is not a little surprising that, although steam-boats have been in constant use for so many years, nevertheless the vibration, which passengers find so unpleasant, and which is so destructive to the vessels and so expensive to the owners, should still remain a puzzle to the engineer? Yet so it is. Not one of the many writers on the subject has suggested even a plausible explanation of the phenomenon. With regard to paddle steamers, indeed, the notion that the oscillatory movement was caused by the beat of the paddle-boards as they successively struck the water, has hitherto passed muster—but this could not apply to the screw. If the screw were completely immersed, the resistance offered by the water to its revolution, whatever might be its nature, ought at least to be regular—there would be nothing vibratory about it; yet the screw steamers are found to shake even worse than the paddle steamers. What could be the cause of this anomaly no one seemed able to tell. Some attiibuted it to the length of the shaft through which the force of the engine was transmitted to the screw. But in many large factories the length of shafting may be reckoned by furlongs instead of yards; yet the power of many hundred horses is transmitted in all directions, horizontally and perpendicularly, over a vast area, and up to the seventh story of a large edifice, which would be shaken to pieces in a day by one-fiftieth part of the vibration experienced in a moderate-sized screw-steamer. What could occasion so great a difference in the result under circumstances that appeared identical? This is a question which all steamship owners will acknowledge to be of the utmost importance, though it has never hitherto been answered. And yet the reason seems to be very simple. While expending a vast amount of ingenuity in perfecting the details of their machines, our marine engine-makers have overlooked the all-important fact, that, in their case (as distinguished from the land engine), when they cause the piston to rise and fall within the cylinder they have to deal with *two* moving bodies instead of *one*. On land the cylinder rests on the solid earth, and is fixed; but on board a ship the cylinder is not fixed, and cannot, by any possibility, be fixed—since, however massive may be its framework, the ultimate foundation is the bottom of the ship, which is essentially a moving body. The natural consequence is this: Whenever steam is admitted below the piston its elastic force tends to press the bottom of the cylinder downwards, just as much as it impels the piston upwards—and, as both yield to the pressure, they both move in opposite directions, and through spaces corresponding to the *momenta* of their respective resistances. The piston rises, and the cylinder—*id est* the vessel altogether—sinks. Just the reverse action ensues as the piston descends, and this "up and down" action recurs upon every revolution of the shaft. How enormous is the oscillatory force thus exercised may be easily computed. Take, for example, a 45-inch cylinder (a very common size for engines in the mercantile navy), and suppose that the medium pressure of steam throughout the stroke is 25lbs. per circular inch including vacuum. This gives an aggregate pressure of 50,000lbs. (or more than 22 tons), operating alternately upward and downwards with every revolution of the engine. The effect on the vessel is actually equivalent to that produced by the beat of a steam hammer of more than 20 tons, vibrating from 30 to 100 or 150 times per minute. No wonder that the ship shakes under such discipline. No wonder that splendid steamers return after a short cruise with their sterns rattled to pieces. Engine-makers have devoted much ingenuity to what they call "balancing" their cranks. This is straining at the gnat and leaving the camel still to be swallowed. They must "balance" their steam before they can pretend to have remedied the existing evil.—I am, &c., A. J. JOYCE.
18, Gower-street.

MEETINGS FOR THE ENSUING WEEK.

MON. ...British Architects, 8.
Asiatic, 3. Annual Meeting.
R. United Service Inst., 8½. Captain Edmund A. Inglefield, R.N., "On a proposed Plan of Working the Heaviest Ordnance on board Armour-plated Ships and Fortifications, with complete Protection for the Men."
TUES. ...Civil Engineers, 9. President's Annual Conversazione.
Anthropological, 8.
Royal Inst., 3. Professor Marshall, "On Animal Life."
THUR. ...Antiquaries, 8.
Royal Inst., 3. Mr. John Hullah, "On Music."
Linnæan, 8.
Chemical, 8. Prof. Stokes, "Discrimination of Organic Bodies by their Optical Properties."
R. Society Club, 6.
FRI.......Philological, 8.
Royal Inst., 8.
Archæological Inst., 4.
SAT ......Royal Inst., 3. Mr. Alex. Herschel, "On Falling Stars and Meteorolites."

PARLIAMENTARY REPORTS.

Par. Numb.

55 (5). Railway and Canal Bills—Sixth Report from Committee.
227. Superannuations (Persons now employed in any public capacity)—Return.
240. Army (Chaplains, &c.)—Return.
170. Superannuations (Public Offices)—Account.
82. Bills—Customs and Inland Revenue (amended).
83. — Union Assessment Committee Act Amendment.
63. — Naval Agency and Distribution (amended).
64. — Naval Prize Acts Repeal (amended).
65. — Naval Prize (amended).
84. — Writs Registration (Scotland).

Delivered on 3rd May, 1864.

215. Education (Mr. Morell)—Copy of Correspondence.
85. Bill—Under Secretaries Indemnity.

SESSION 1863.

509. Island of St. Vincent—Copy of Correspondence.

Delivered on 4th May, 1864.

62 (3). Committee of Selection—Fourth Report.
241. Militia Regiments (Establishments, &c.)—Return.
252. Primrose-hill Meeting—Return.
247. Poor Law (Sarah Dove)—Return.
87. Bills—Joint Stock Companies (Foreign Countries).
88. — Admiralty Lands and Works.

Delivered on 5th May, 1864.

172. Works and Public Buildings—Abstract Accounts.
229. West Riding of Yorkshire Assizes—Returns.
232. Foreign Sugar—Account.
250. Banks (Scotland)—Return.
256. Seamen's Savings Banks—Account.
East India (Substantive Law)—First Report of Commissioners.

Delivered on 6th May, 1864.

217. Excise and Customs (Ireland)—Returns.
222. Highways Act—Copies of Memorials.
244. Metropolis Turnpike Roads—Thirty-eighth Report of Commissioners
251. New Zealand Loan—Copy of a Letter dated 29th December, 1858, &c.
86. Bills—Superior Courts of Common Law (Ireland).
92. — Public and Refreshment Houses (Metropolis).

Delivered on 7th and 9th May, 1864.

230. Vestry Cess (Dublin)—Return.
249. East India (Officers of Native Regiments)—Return.
259. Civil Bill Courts (Carrickfergus)—Return.
255. Merchant Seamen's Fund—Account.
257. Mercantile Marine Fund Account.
263. Fortifications, &c.—Account.
266. East India (Mr. Burgass)—Correspondence, &c.
279. Civil Services—Supplementary Estimate (Class 1).
246. British Museum—Accounts and Estimate.

89. Bills—Boiler Explosions.
90. ,, Street Music (Metropolis.)
94. ,, Limited Penalties.
91. ,, Pier and Harbour Orders Confirmation.

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493 (5). Import and Export Duties—Return (Part 6).

Delivered on 10th May, 1864.

236. Police Inquiry (Dundrum)—Return.
254. Public Buildings (South Kensington)—Return
North America (No. 11)—Return of Claims of British Subjects.
North America (No. 12)—Correspondence respecting the Enlistment of British Seamen at Queenstown.

Delivered on 11th May, 1864.

55 (6). Railway and Canal Bills—Seventh Report from Committee.
258. Ramsgate Harbour—Statement of Receipts and Payments.
261. Tenure and Improvement of Land (Ireland)—Abstracts of Returns.
265. Decimal System of Measures, &c.—Return.
269. Thames Conservancy—General Report.
272. Public Meetings (Metropolis)—Return.
273. Established Church (Ireland)—Return.
98. Bills—College of Physicians.
99. ,, Railways (Ireland) Acts Amendment.
100. ,, Drainage and Improvement of Lands (Ireland.)
102. ,, Valuation of Rateable Property.

Delivered on 12th May, 1864.

204. Education—Return.
238. Grand Jury Presentments (Ireland)—Abstract of Accounts.
264. Illicit Distillation (Ireland)—Return.
275. Law Life Society—Return.
276. Military Savings Banks—Account.
289. Civil Service Estimates—Abstract showing the Grants to be proposed.

Patents.

From Commissioners of Patents Journal, May 20th.

GRANTS OF PROVISIONAL PROTECTION.

Anchors—1129—A. V. Newton.
Anchors, construction of—1103—W. I. Meacock.
Aniline colours, substitute for—993—D'H. Lomer.
Animal charcoal, treatment of—1119—E. Beanes.
Arches, bricks used in the formation of—1077—J. Davidson.
Armour-plating and batteries of war—1067—C. O. Papengouth.
Artificial fuel, manufacture of—1118—W. Smith.
Blast furnaces—1185—M. Morgans.
Boilers, &c.—1063—L. E. C. Martin.
Boots and shoes, protecting parts of—1155—J. H. Johnson.
Bottles, apparatus for securing stoppers for—1128—J. Thompson.
Bottles, jars, &c., apparatus for stopping—1187—N. Thompson.
Building, treating clay, artificial stone, &c., for—1076—R. H. Smithett and J. Davidson.
Buildings, connecting bricks together in—1078—R. H. Smithett.
Buildings, material for roofing or covering—1169—J. F. Empson.
Carriages, application of brakes to—1130—W. Jarvis.
Cartridges, filling, closing, and finishing—1122—Y. Parfrey.
Churning, apparatus for—1052—E. Taylor.
Collar and neck-tie, combined—1025—E. S. Simon.
Crinolines and trimmings—1167—E. Tombs.
Drags and carriages—1120—J. McDowell.
Dress, new article of—1157—J. H. Johnson.
Dried fruits, apparatus for cleaning—1091—J., T. J., and J. Parker.
Electric telegraphs—1071—G. Schaub.
Engines, motive power—1173—F. H. Wenham.
Engines, steam and caloric—1099—M. P. W. Boulton.
Fabrics, holding and stretching—1165—E. Heywood.
Fats, seeds, &c., apparatus for pressing—1100—J. L. Norton, F. Gregory, and J. Salmon.
Fibrous materials, separating the woody parts from—1115—D. Nevin and W. Coppin.
Figured fabrics, looms for weaving—1102—J. H. Johnson.
Fire-arms, breech-loading—1163—W. Powell.
Fire-engines, floating—1127—M. Coghlan.
Food, preparing and preserving—1082—J. McCall and B. G. Sloper.
Fuel, motive power by the combustion of—1112—M. P. W. Boulton.
Gas burners, chimney for—1094—R. A. Brooman.
Gas, furnaces used in the manufacture of—1087—F. C. Hills.
Gas, purification of, &c.—1088—F. C. Hills.
Grain or seeds, screens for cleaning—1104—G. Gell and W. Cafferata.
Hair brushes, revolving—1098—J. Bessac.
Hats perfectly grease-proof—1075—F. T. Aldridge and M. J. Jackson.
Hinges for ships' ports, &c.—1069—A. Notman.
Iron and steel, manufacture of—1114—E. H. Newby.
Iron, manufacture of—1083—W. C. Cambridge.
Iron, manufacture of—1143—J. Shortridge.
Kitchen boilers, self-acting valves for—1064—J. Cookson.
Lamps, miners' safety—1121—B. Hammerton.
Lamps, ornamenting the globes and shades of—1101—J. Hunt.
Medicinal substances, inhalation of—1161—A. V. Newton.
Medicines, capsulation of fluid—1073—M. A. F. Mennons.
Metals, machinery for planing—1116—R. Thompson.
Motive power, apparatus for obtaining—1085—J. Harvey.
Note books, counter slip—1109—J. O. Bradley and R. Fielding.
Omnibuses, &c., applying motive power in the traction of—1153—J. Tomlinson.
Ordnance, &c., projectiles for—1079—J. Corry, jun.
Ores, &c., apparatus for washing—1107—P. A. L. de Fontainemoreau.
Ornamental fabrics—1090—J. K. Crawford.
Pavements—1080—J. Little.
Petroleum oils, &c., arranging steam boilers and furnaces for burning—1131—C. J. Richardson.
Photographic pictures and marble papers—1111—A. W. Gittens.
Puddling furnaces—1145—J. H. Poole and J. Astbury.
Pumps, construction of—1105—F. S. Barker.
Punching machines—1159—J. Cameron.
Railway break apparatus—1141—I., J., C., L., and M. Jefferson.
Railway carriages, &c., roof lamps for—1086—D. C. Davies.
Railway carriages, &c., springs for—825—E. Lindner.
Railways, atmospheric—1195—A. Alison and J. Halliwell.
Reaping and mowing machines—1189—J. Moore.
Refrigerators—1123—W. McVitie.
Seats, cushions, &c., springs used in—1054—L. A. Durrien.
Seaweeds, treatment and application of—1072—T. G. Ghislin.
Sewage matters, utilisation of—1191—T. Walker.
Ships, apparatus used in the repairing of—1023—W. E. Newton.
Ships, masting of—1147—J. Turnbull.
Steam cultivation—1117—R. Garrett, jun.
Steam engines—1139—G. Haseltine.
Sunken vessels, &c., apparatus for raising—1084—J. C. Browne.
Tanning—1095—R. A. Brooman.
Telegraph wires and cables—1126—W. T. Henley.
Textile fabrics, stamping and embossing—1110—S. Shaw and H. Fishwick.
Umbrellas—1175—W. G. Haig.
Ventilating apparatus—937—T. Steven and C. Batty.
Vessels, construction and propulsion of—871—W. B. Adams.
Vessels, plating and sheathing for—1135—H. H. Henson.
Vice, construction of—1070—A. V. Newton.
Washing, blue colouring matters for—1125—T. H. Rees.
Wheels—1137—R. A. Brooman.
Wheels, construction of—1066—R. Melling, jun.
Wood, &c., production of alcohol from, and paper manufacture with the fibre of—1081—R. A. Brooman.
Work boxes—1096—J. Mieussey.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Screws, manufacture of—1214—G. T. Bousfield.

PATENTS SEALED.

2948. J. Platt.
2949. G. W. Yapp.
2951. D. W. Rea.
2955. J. Lewis.
2963. G. Parkin.
2969. H. B. Barlow.
2970. D. Kirkaldy.
2971. R. Laming.
2979. W. C. Brocklehurst, and J. and J. Creighton.
2988. S. and T. Smith.
3003. C. Pontifex.
3017. G. Glover.
3052. R. Hornsby, jun.
3054. R. Hornsby, jun., and J. E. Phillips.
3071. M. Turnor.
3079. W. Wanklyn.
3095. W. M. Cranston.
3121. W. Livingstone.
3131. E. Solvay.
3171. J. Smith.
3195. W. B. Adams.
3213. W. H. Tooth.
52. A. J. S. Graham.
60. D. Pidgeon and W. Manwaring.
87. J. Wheatley.
173. C. T. Woodman.
538. E. Hall.
599. S. Blackwell.
605. J. Clayton.
677. J. Dauglish.

From Commissioners of Patents Journal, May 24th.

PATENTS SEALED.

2968. J. H. Wilson.
2972. J. Thorpe.
2973. J. Simmonds.
2974. J. Baker.
2975. J. Nadal.
2977. J. Chesterman.
2978. J. A. R. Main.
2980. T. Gray.
2982. J. Bateman and D. Bateman.
2985. J. Clark.
3013. H. Lumley.
3015. W. Clark.
3019. T. Mallinson.
3029. H. Holdredge.
3043. E. Stevens.
3123. J. Corby.
3217. E. Tangye.
99. W. Hanlon, G. Hanlon, T. Hanlon, and A. Hanlon.
377. T. Smith and T. Lister.
795. W. E. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1261. A. Allan.
1339. G. Asher.
1334. G. H. Birkbeck.
1305. L. Lumb & W. H. Butterworth.
1306. C. Nuttall.
1314. C. Batty.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1400. C. F. Vasserot.
1405. J. F. P. L. Von Sparre.
1413. J. Hardley.
1460. S. Fox.
1459. T. Silver.
1726. S. Fox.
1428. E. C. Kemp.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, JUNE 3, 1864. [No. 602. Vol. XII.

Announcements by the Council.

Presentation of Medals and Prizes.

His Royal Highness the Prince of Wales, K.G., President of the Society, has been pleased to appoint Friday, the 24th of June, at three o'clock, to present the medals and prizes awarded during the present Session. The Presentation will take place at Willis's Rooms, King-street, St. James's. Members will be admitted by ticket only, for which application should be made to the Secretary; each ticket to admit the member and one lady. The tickets are now ready for delivery.

Conversazione.

The Council have arranged for a Conversazione at the South Kensington Museum on Thursday evening, the 16th June, cards for which are now being issued.

Notice to Institutions and Local Boards.

The Thirteenth Annual Conference between the Council and the Representatives of the Institutions in Union and Local Boards, will be held on Thursday, the 16th June, at Twelve o'clock, noon. William Hawes, Esq., Chairman of the Council, will preside.

Secretaries of Institutions and Local Boards are requested to forward, as soon as possible, the names of the representatives appointed to attend the Conference.

The Council will lay before the Conference the Secretary's Report of the proceedings of the Union for the past year, and the Results of the Examinations.

The Programme of Examinations, Elementary and Final, for 1865, will also be laid before the Conference.

The following subjects are suggested for discussion :—

1. In what manner can the agents of the District Unions, who have been appointed agents to the Society of Arts in their respective localities, best carry out the objects of the Society, and promote the welfare of the Institutions?

2. The advantages of District Unions; how the Society of Arts may best promote their formation, and aid them when formed?

3. The best means of developing the social character of the Institutions.

4. The best mode of promoting Popular Readings as a department of the work of Institutions.

5. What is the influence of the Working Men's Clubs, formed in various localities, on the educational character of the Institutions in those localities?

6. The best means of providing for the Education of Women and Girls after they have left their Day-schools.

7. Would it be desirable to add "Needlework" to the subjects of Examination in the Programme of the Society of Arts?

8. How can Physical Education be promoted by the Institutions, by the District Unions, and by the Society of Arts?

9. The advantages of "Youths' Institutes," *i.e.*, separate Institutes, or separate departments of Institutes, for Youths?

10. The Prizes for Art-workmanship annually offered to Art-workmen by the Society of Arts; how far can the District Unions, Local Boards, and Institutions, assist in giving publicity to this competition, and in encouraging those likely to be competitors?

11. Would it be desirable to allow a certain limited share in the government of Institutions to such of the members as may have obtained Certificates in the Examinations?

12. If the Society of Arts were to publish a calendar, with the names of all candidates who have obtained certificates and prizes from 1856 to 1864, at a price to be named, would there be any considerable number of copies subscribed for?

Notice of any other subjects which representatives may desire to bring forward for discussion should be given to the Secretary of the Society of Arts.

The Secretary of each Institution is requested to forward, by book-post, a copy of the Annual Report of his Institution.

Representatives of Institutions and Local Boards attending the Conference are invited to the Society's Conversazione, at the South Kensington Museum, on the evening of the same day (16th June), and will receive cards on application at the Society's House, on the day of the Conference.

Proceedings of the Society.

Conference on the Dwellings of the Labouring Classes.

In accordance with the circular letter issued by the Council, a Conference on this subject was held on Thursday, the 26th, and Friday, the 27th May, commencing each day at half-past eleven. The chair was occupied by William Hawes, Esq., Chairman of the Council.

Amongst those present were:—The Earl of Lichfield, Earl Grosvenor, Lord Berners, Lord Lyttelton, Lord Talbot de Malahide, Lord Feversham, Sir John P. Boileau, Bart., Sir Christopher Rawlinson, the Hon. and Rev. S. Best, Mr. Gregson, M.P., Mr. Marsh, M.P., Mr. Whalley, M.P., Mr. Alderman Waterlow, Mr. W. H. Bodkin (Assistant-Judge), Dr. Farr, F.R.S., Dr. Hancock, Dr. Waller Lewis, Dr. Milroy, Dr. Edward Smith, F.R.S., Rev. J. W. Buckley, Rev. Thos. Pyne, Rev. Banks Robinson, Rev. A. W. Thorold, Rev. G. F. Townsend, Rev. L. Tugwell, Mr. Edward Akroyd, Mr. Harry Chester, Mr. Henry Cole, C.B., Mr. J. C. Colquhoun, Mr. John Dillon, Mr. Robt. Dimsdale, Mr. H.W. Freeland, Mr. George Godwin, F.R.S., Mr. Frederic Goldsmid, Mr. Peter Graham, Mr. Thos. Hare, Mr. C. Wren Hoskyns, Mr. S. Redgrave, Mr. Robert Rumney, Mr. Thos. Winkworth.

Letters, expressing regret at being unable to attend, were read from the Duke of Sutherland, the Duke of Manchester, the Marquis of Salisbury, the Earl of Derby, Earl Grey, the Earl of Harrowby, Earl Fortescue, the Bishop of London, the Bishop of Oxford, Lord Stanley, M.P., the Right Hon. W. E. Gladstone, M.P., the Right Hon. W. Henley, M.P., the Right Hon. C. B. Adderley, M.P., the Hon. Arthur Kinnaird, Mr. Walter, M.P., Mr. Bazley, M.P., Mr. Cheetham, Mr. T. D. Acland, Mr. John Stuart Mill, and other gentlemen.

The discussion was taken under the following heads:—

1. On the insufficient number of habitations for the labouring classes in town and country.

2. On the badness of the existing accommodation.

3. On the effects arising from this state of things, viz.:—
   - (*A*) Religious, moral, and social.
   - (*B*) Sanitary.
   - (*C*) Economic.

4. On the causes to which these evils may be, or have been, attributed, such as—
   - (*A*) The Law of Settlement.
   - (*B*) The Poor Laws.
   - (*C*) Tenure of property, such as mortmain, leasehold system, tenancy for life, &c.
   - (*D*) Legal difficulties affecting the transfer of property.
   - (*E*) Difficulty of providing proper dwellings at a cost which will be remunerative to capital in town and country.

5. Remedies:—
   - (*A*) What can be done by legislation?
   - (*B*) What can be done without legislation?
   - (*C*) What assistance, if any, can the Society give in either of these directions?

The Chairman, in opening the proceedings, said they would all agree in the importance of the subject now before them for discussion, and in the vastness of the interests connected with it, and also in the opinion that it strictly belonged to this Society to use every means in its power not only to promote discussion, but, if possible, to suggest some plan by which the existing evils might be remedied. But, while acknowledging the importance and vastness of the interests concerned, they must not forget the difficulties by which the subject was surrounded, whether they looked at it as a moral and social, or as a pecuniary and political question. The Council of the Society, with a view to give as practical a character as possible to the discussion, had divided the subject under five heads. On the two first —viz., "The insufficient number of habitations for the labouring classes in town and country," and "The badness of the existing accommodation," he thought the discussion need not occupy much time; and as their object was purely practical, he hoped they would, as much as possible, whilst affirming these propositions, confine their observations to such illustrations of the subject as would, by their novelty and aptness, give weight to the generally-received opinions. If they wished to know what was the condition of the habitations of the labouring classes in London, he would refer them to the works published by his friend Mr. Godwin, which were accompanied by such illustrations as would satisfy them that in London there was room for enormous improvement, which was imperatively required. With regard to the country, he knew of no one who had done for the provinces that which Mr. Godwin had done for London; but it was admitted by every one who had inquired into the subject, that in the rural districts there were vast numbers of cottages which were not fit for human beings, nor calculated to afford to the young, who were receiving the benefits of education, that opportunity of rising in the social scale they ought to possess. He next came to the heads under which the effects arising from this state of things were classed. These were divided into the "religious, moral, and social, the sanitary and economic." The sanitary and economic would run very much together, still they had each distinct aspects. Then they came to the causes of these evils; and first there was the Law of Settlement. Everybody was aware that the law of settlement, even modified as it had been of late years, was still one of the most crying evils of the time as affecting the subject under consideration, more especially in the rural districts. No doubt, before manufactures were distributed all over the country, and before agriculture was relieved from the fiscal restrictions which formerly existed, there was a certain degree of jealousy between the two classes of the population in the agricultural and the manufacturing districts, each predominating in its turn, and each experiencing periods of prosperity and adversity. The two periods were seldom coincident, and under the then existing state of things, the good feeling which ought to exist between the manufacturing and the agricultural population was frequently disturbed. As to the influence of the Poor Laws, it was not so much upon the dwellings of the poor as upon their habits and thoughts, tending to lessen their interest in the soil they tilled, and in the landlord for whom they worked. Next, there was the "tenure of property, and the legal difficulties affecting the transfer of property." There was no doubt great room for improvement in these respects, and, lastly, they came to the most important questions of all, "What could be done by legis-

lation, and what could be done without legislation," to remedy the evils which all admitted to exist, and they concluded by asking the meeting to suggest any mode by which this Society could give its assistance in one way or the other. If it was thought the Society could assist by an appeal to the legislature, he was authorised by the Council to state that they would be only too happy to co-operate in promoting whatever the Conference might think best in that direction. If, however, it should be thought more good could be done without legislation, then the *Journal* of the Society would be open to communications and practical suggestions from those who would forward them to the secretary; and the rooms of the Society, and the services of its officers, would be at the disposal of those who desired to take active practical steps to forward the great object they had in view, viz., the improvement of the dwellings of the poor, by which their comforts might be increased, the value of their labour enhanced, and their families raised in social position in the country. He now begged to invite observations on the first subject on the list, viz.:—"On the insufficient number of habitations for the labouring classes in town and country,"

Mr. S. Redgrave suggested, that, as such abundant evidence existed in confirmation of the first two propositions, they should pass on to the consideration of the next topic.

Mr. Benjamin Shaw said, looking to the vast demolition of dwellings occasioned by street improvements and the construction of railways, it was important to consider whether the local authorities in the one case, and the railway promoters in the other, should not be called upon to provide accommodation for dwellings elsewhere.

Mr. Bodkin suggested that that consideration would come more properly under the head of "Remedies."

The Chairman having put to the meeting the confirmation of the first two propositions,

Mr. George Godwin, F.R.S., was not content that the first two propositions should be so rapidly passed over. The Chairman had been so good as to allude to his (Mr. Godwin's) endeavours for many years past to make known the condition of London in regard to dwellings for the labouring classes. His writings on the subject went to prove the truth of these first two propositions. But he had not been listened to. Houses described ten or twelve years ago as having in every room a separate family; houses of ten and twelve rooms, containing 40 or 50 people, remained in the same bad state. It was true these statements had often been made before, but it was only by frequent reiteration the public could be made to think seriously of these things. It was not alone in the old tumble-down houses of London that this crowding of families existed, but the same state of things was to be found in newly-built houses in new streets. Eight-roomed houses—not old—built for one family, with domestic appurtances for one family, were found to be occupied by a family in each room, with a total disregard of the decencies of life. The public required to be constantly reminded of these facts, and even now they found educated men questioning whether degradation of health and consequent degradation of morals really resulted from this mode of life. No one could inquire into the condition of any of these houses without finding that a low state of health was brought about, which, on the part of adults, led them to the gin-shop, and produced a weakly and sickly population, while the children living herded together in this manner lost all sense of decency; they were educated downwards, and there was no wonder they resulted in a population of thieves and prostitutes, while in the middle class families, under ordinary circumstances, the children grew up honest, healthful, and virtuous. The children brought up in the dwellings he had described must necessarily grow up pests to society, and constantly recruited the ranks of the "dangerous classes." These were the people that formed the great bulk of the crowd at public executions, and who were otherwise seldom seen in daylight. The children were brought up to theft as a trade, and the chance of getting into prison was one of the ordinary risks attaching to the profession; and those who did not die off—as the large majority did —were a constant expense to the more honest part of society. He mentioned these matters in order to show the enormous amount of evil which was being done by the over-crowded state of the dwellings of the poor.

Mr. Wm. Long would remark, under this head, that the Society might use its influence in acting upon public bodies or the legislature. A more fitting time could not have been chosen for the discussion of this subject. Many efforts were being made to mitigate all the existing evils. The trustees of Mr. Peabody's munificent gift had erected buildings of a substantial and imposing character; but, at the same time, the rents were such that none but mechanics, earning good wages, could occupy them. Under a particular Act of Parliament the Corporation of London had a fund now at its disposal for the same object, and, he believed, it could be shown to them that, in the erections they intended to carry out in Farringdon-street, if they built a particular kind of house for the working classes of that district the undertaking would prove highly remunerative. He was warranted in this assertion by the accounts of the society with which he was connected—the Society for the Improvement of the Dwellings of the Labouring Classes. In the case of that society their operations were decidedly remunerative; and he submitted that the authorities of the City might advantageously make use of the experience thus gained. He would suggest that when these houses were erected, admission to them should be given, in the first instance, upon the recommendation of the great employers of labour in the locality, the clergy, and others. He had taken a personal interest in maintaining the late Smithfield-market area as an open space, the efforts for which failed; but, he believed, in the erection of the new meat market some provision would be made with a view to buildings for the working classes, as a vast number of houses had been swept away, and a great mass of people dislodged. Though we might hope eventually to see suburban villages for the labouring classes of London, still there were great numbers who must reside where they were employed. On the third head of this subject—viz., the effects arising from the present state of things, he could hardly trust himself to speak. Leaving out the question of religion, he believed the moral effects were beyond conception. He did not know whether those he was addressing had ever visited any of the courts in the Strand. They might go into one court and find it occupied by respectable persons, the houses well organised, clean, and the rooms well attended to; while, in another court in the same vicinity, they found the state of things which had been so ably referred to by the last speaker.

Rev. L. Tugwell could, from his personal knowledge and experience as a clergyman in London, confirm the statement made as to the insufficiency of the number and badness of accommodation of houses for the working classes. There were in his own parish (St. Giles's) many houses to which he had called the attention of the officer of health, who stated he would condemn the houses if the poor people had any other place to go to. He had seen frequently as many as eight persons living and sleeping in one very small room. The great want of the locality was decent accommodation for these poor people at the same rent they now paid, for they were paying very highly for the miserable rooms they now occupied.

Mr. Archibald White said that, so great was the demand for dwellings of a superior description, that in a parish in Buckinghamshire, 2,000 acres of waste land had been enclosed and covered with cottages which were let before they were finished.

Rev. Thos. Pyne said that, in many country districts, the state of things was as bad as in London and large towns. He thought it very desirable that they should be in possession of statistics, showing the number of dwellings, as compared with the population at large, which he had no doubt would give the public an idea of the true

state of things in reference to particular districts. He did not believe the public generally were aware of the wretched character of the dwellings of the working classes.

Mr. Marsh, M.P., remarked that, while they must be unanimous on the two first propositions, and must all agree that the houses were as bad as they could be, it was worthy of notice that the dwellings were in many cases the same as they were years and almost centuries ago. It was, therefore, a consolation that they were met to deal with an evil which had not sprung up lately, but one which had existed from time immemorial. He knew cottages which had remained in the same condition in one family for 400 years. It was satisfactory to know that they were met to deal with an evil for which they might hope, sooner or later, to find a remedy.

Mr. W. Westgarth said the fact of poor people paying two and three shillings per week for a miserable room, in a wretched house, showed how scarce the accommodation was; and the people would gladly go elsewhere if they had the opportunity.

Mr. Thomas Hare, in reference to the observation from Mr. Marsh that they were not to deal with an evil which had existed for centuries, said, however much that might apply to places where the population had not increased, it did not apply to London and large towns generally. Mr. Godwin had pointed out evils which, so far from decreasing, it was to be apprehended were increasing with the growth and concentration of population in large cities, and with the increase of our commerce and manufactures, and those evils had increased within the present generation.

Mr. Marsh explained that his observation had reference to the country; he had no doubt that the last speaker was quite correct in his remarks as to towns.

Mr. W. H. Bodkin (Assistant Judge) said, as he was unable to remain till they came to the subject of the "remedies," he would direct the attention of those who had thought what remedies, legislative or otherwise, should be adopted, to the fact that much of this crowding of families in one room—so graphically described by Mr. Godwin, was to be attributed to the desire of the poor themselves to underlet the houses which they occupied. He had seen houses which were well constructed, and where the rooms were adapted to the accommodation of a family with decency and comfort, but the disposition to get a portion of the rent repaid induced the occupiers to under-let the rooms to others, and caused the evils arising from crowding to which allusion had been made. He mentioned this because one of the most important points in considering the remedies would be the best mode of controlling this overcrowding.

Mr. G. M. Murphy, having referred to the destruction of whole streets of house property in Southwark for railway purposes, thought this Conference might suggest that if railway companies caused this paucity of dwellings they ought to be called upon to take some steps towards supplying the wants they created. The evil in this respect on the south side of the Thames was terrible; in some cases whole streets had been destroyed; in others, the outhouses were taken down, while the dwellings remained without the accommodation required for comfort and decency. He thought, as to the insufficiency of dwellings in towns, one great cause had been the immense destruction of dwellings in the poorer neighbourhoods, for railway companies sought, as much as possible, to avoid the richer localities and destroyed the poorer class of property. Mr. Peabody's gift to the City was a magnificent one, but he was afraid it would be an evil rather than a good, for it would shake the confidence of the working people when they saw the money given for their benefit expended in buildings the rents of which were, for the most part, entirely out of their power to pay.

The Chairman then read the following resolution, as embodying the opinion of the meeting on the first two propositions, viz.:—

"That it is the unanimous opinion of this meeting that there is at present, in town and country, a very insufficient number of dwellings for the labouring classes, and that the accommodation is bad and unsuitable for the classes now occupying these dwellings."

The resolution having been unanimously agreed to,

The Chairman called attention to the next subject under this first head, viz.:—"The effects arising from this state of things—religious, moral, and social, sanitary and economic."

Rev. Banks Robinson, as vicar of a parish in the county of Suffolk, had met with the most painful experiences of the evils arising from the present state of the dwellings of the poor. He mentioned instances of evils arising from this state of things.

Rev. T. Pyne mentioned that in the Union of which he was a guardian, they had been obliged to erect a fever hospital at an expense of £900. That was one of the economic results of the present state of the dwellings of the labouring classes. There could be no doubt of the fact that diseases of a febrile character were propagated by the miserable condition of the houses, the over-crowding, and the want of means of proper ablution.

Mr. Marsh, M.P., remarked that the sanitary and economic questions were bound together. Workmen in the country, partly through the clearing of cottages from estates under the present law of settlement, had often to walk long distances to and from their work, which was a most uneconomical arrangement, as much of the physical energy that would otherwise be employed in labour, was expended in walking to and from it. That was a question which called for consideration.

Mr. S. Redgrave thought the deteriorated condition of the health of female domestic servants must have been remarked, the seeds of ill-health having been sown in early life, arising from the unhealthy habitations in which they were brought up during their youth.

Mr. C. Wren Hoskyns said the economic question was largely mixed up with the other points included under this head. It was notorious that the want of sufficient cottages in the country often obliged the agricultural labouring population to walk several miles to their work. The walking alone was nearly equal to a day's march of a soldier, in addition to which the day's labour had to be performed, although, under such conditions, the labour must necessarily be of a very deteriorated character. The economic effect was to make wages higher where the labourers lived at a distance from their work, and to make the article of labour supplied inferior to what it would be under more favourable conditions.

Rev. L. Tugwell said the existing state of things was most injurious to the religion and morality of the country. He had remarked that where people were most crowded together in houses, there they were most indifferent to religious duties. As regarded morality it was evident to all who were conversant with people in such circumstances that it was in a very low state indeed, where fathers, mothers, and grown-up children are all sleeping in one room. This state of things drove the elder members of the family to the gin-shop, and the children into the streets, where they came in contact with children of a better class amongst whom they spread the seeds of vice, and the evil was extended far and wide. With regard to the sanitary state of those habitations it was fearful. Fever broke out in his parish a year ago, and had prevailed ever since. It commenced in a miserable hovel, not fit for human habitation, and spread all over the parish. He thought it advisable that the medical officers of parishes should be perfectly disconnected from, and wholly independent of, the parochial authorities, as the duties would, under such circumstances, be better performed.

The Chairman said he would read the resolution, which he believed would represent the opinion of the meeting on this point, viz.:—

"That the evil effects arising from this state of things in a religious, moral, social, sanitary, and economic point of view, in the opinion of this meeting demand the immediate and serious attention of the country."

The resolution was unanimously adopted.

The Chairman said they now came to the consideration of a much more important point, viz.:—

" The causes to which these evils may be or have been attributed: such as the law of settlement—the poor laws—tenure of property: such as mortmain—the leasehold system—tenancy for life, &c.; legal difficulties affecting the transfer of property; difficulty of providing proper dwellings at a cost which will be remunerative to capital in town and country."

Lord Berners said it was only necessary to refer to the statistics laid before Parliament to see the extent to which the poor had been driven from the rich parishes of the west into the poor parishes in the eastern districts of the metropolis. In parishes in the west of London, where 20 years ago the poor rate was 4s. or 5s. in the pound, it was now scarcely as many pence; whilst a corresponding increase had taken place in the rates of the eastern parts of London. He conceived that the abolition of the existing laws of settlement and removal would be one of the greatest boons that could be afforded to the poor man, and would remedy many of the existing evils. They must be aware that in the country there were what were called open parishes and close parishes. At one period of his life he held the opinion that a country gentleman did his duty if he saw that the parish in which he lived was put into a perfect state with regard to the cottages and their condition; but on further looking into the subject, he found that what were called " model parishes " were the worst that could be. That was where builders ran up a few cottages, which were let at high rents to persons of questionable character, who had been driven out of the close parishes and congregated in a mass in the open parishes; and that was one of the reasons why he felt satisfied—after a good deal of consideration of the matter—that the abolition of the laws of settlement and removal would be a great boon to the working classes. He thought that a cottage occupied by a family should not have less than three sleeping rooms; but it was desirable that in country parishes there should be different classes of cottages, one of which should consist of ground floor only, for the occupation of aged people, and which could be let at a very low rent; another class at a little higher rent, and adapted for young married people; but that, for the generality of cottages, there should be three sleeping rooms. He hoped to see some practical results from the discussion in which they were now engaged; but it could not be too much impressed upon their minds that they must not hope to engage in the building of labourers' cottages as a matter of pecuniary profit; though it was undoubtedly the duty of the proprietors of the soil to supply proper cottage accommodation.

Mr. John Dillon said they had arrived at the most important part of the discussion. They had considered the effects, and were now debating the causes. This he thought the most essential part of the inquiry, because the discovery of the causes would enable them to apply the remedy which was to remove them. He did not confine this question to whether a cottage should have two or three sleeping rooms. It affected the moral condition of the people at large, not the poor only. If they erected better houses they would have better men and better women. It affected their education, their moral condition, and their political standing. If they saw the labouring classes aspiring to political privileges they must give them good education, good habits, and render them fit to exercise those privileges aright. They had the fact before them that in this great commercial country, where so much capital was employed, very little of it had been devoted to the providing of dwellings for the working classes, either in town or country. The noble lord who preceded him had stated that landed proprietors must not expect to provide habitations for the poor in the hope of their being remunerative as an investment. It was on that account that he (Mr. Dillon) had risen to say that the operation of the Poor Law was vitally connected with the question, and was one of the causes they were now inquiring into. It was very properly urged that in the existing state of the laws of settlement and removal it was not to the interest of the landed proprietors to build good cottages on their estates, and that they really injured their estates thereby. He believed that to be an effective cause of the stagnation of improvement in the houses of the labouring population. It would be out of place to enter at this time into the origin of the poor law, in the time of Elizabeth, but he understood the spirit of that law to be that a man should not be allowed to perish without assistance from his fellow-creatures; the consequence of this was, a fear was created that the certainty of assistance would lead the poor not to exert themselves to provide for their own maintenance; and to counteract that fear various measures had been resorted to, such as the scanty dietaries of the poorhouse; but he thought they might substitute an opposite influence to this, viz., the love of home. Make a workman's home comfortable and happy, and a source of domestic enjoyment, and the love of home would operate far more powerfully than the fear of the workhouse as an incentive to him to support himself. With the proprietor of a large estate, and a man of fortune, the motive was strong to make his dependents as happy and as contented as possible, but there was the latent fear present that if he encouraged population around him he would have to pay for it in poor's rates, and would to that extent injure his estate by providing residences for his workpeople. This he regarded as one of the main causes of the present state of things, for, after all, those engaged in commercial life knew that self-interest would prevail; and if, by the alteration of the poor law, they could make it to the interest of the landowner to provide good cottages on his estate, and to promote the building of good houses in his neighbourhood, they would succeed in the end they sought better than by any other means that could be devised. He would therefore suggest a uniform rating for Unions of parishes in the first instance, which might afterwards be extended to the whole country, from which he believed the most beneficial results would accrue. He thought it right to state that he had changed his views on this subject. He had formerly spoken and written against a national rating for the relief of the poor, but he was now persuaded, if it were acted upon, it would tend to promote the welfare of all classes of the community, for he considered England to be the moral republic of the world, and by our teachings, morally and politically, we had extended the benefits of our system to mankind in general. We had yet a great work to do. Having provided for the wise, the scientific, the learned, and the rich, it behoved us now to provide for the welfare of the poor, and thus we should not only benefit that class of society alone, but the whole community.

Lord Berners, in explanation, said although he had given his opinion that the building of cottages for agricultural labours was not a profitable investment, he hoped at the same time he had made it clear that he considered it not only the duty, but the interest, of the landlord to build as many cottages as could possibly be required for the workpeople on his estate. He had felt this so strongly himself that he had built a great number of cottages, and he found that they paid him, indirectly, from the advantage of having the workmen upon the spot; and the farms had become more valuable in consequence of the labourers being in a condition to do a good day's work, instead of being exhausted by walking several miles to reach their work.

Mr. Murphy coincided to the full extent in all that had been said upon the sanitary part of the question, but it should not go forth from this meeting that the low moral religious condition of the working classes was

entirely owing to the want of better dwellings, because, if that were to be taken as true, the converse should be true also—that where there were good dwellings the religious and moral character of the people would be high, but that was not always the case. He mentioned that, some time ago, he took the trouble of mapping out the district on the south of the Thames, from the foot of Waterloo-bridge to the foot of London-bridge, taking the Borough-road and the new street in Southwark as the boundaries, and he found in that district, which comprised scarcely half a square mile, there were no fewer than 311 public-houses. Tracing the influence of that number of public-houses in such a locality, might they not fairly say, if they could get good men and women they would demand to have better dwellings? He was convinced if it were not for the drinking propensities of the people there would have been no need of this Conference. It was a terrible thing to know that in this country there were no fewer than 840,000 paupers. He did not underrate the difficulties of the laws of settlement and removal, and other parochial intricacies affecting this question, but he thought the great mischief was that, amongst a town population such as he had referred to, there were 311 public-houses in an area in which there were only 50 bakers' and 30 butchers' shops.

Mr. Kime fully agreed with the statement that the building of cottages could not be carried out to be remunerative to either landlord or occupier, looking at it in a pecuniary sense only, and could only be so, having regard to the advantage of the labourers living within easy distance of their work; but the existing poor law exercised an unfavourable influence. He could bear testimony to the fact that the town in which he lived was crowded with agricultural labourers, who had to walk several miles to their work on estates where there were not more than two or three cottages. The result was, that while in the suburban parishes the poor rates were not more than 1s. or 2s. in the pound, in the town to which the agricultural population was driven the rates were as high as 3s., 4s., and 4s. 6d. in the pound. He felt certain that, if the law of settlement were altered, the difficulty of getting landowners to provide cottages would be removed.

Rev. Harvey Brooks agreed with most that had fallen from Mr. Dillon and Mr. Murphy; but he did not concur in the statement, that good men and good women would make good dwellings. He had met with families of working people who, with every desire to maintain the decencies and proprieties of life, had not the necessary accommodation in their houses for doing so, and this no means of their own could procure.

Mr. S. Redgrave remarked, that no one could suppose that all the virtue was in palaces and all the vice in the dwellings of the poor; at the same time it would be found from statistics that much of the crime of the country was engendered and fostered in the most wretched dwellings; and the poor people who inhabited them resorted to the gin shop because it offered so strong a contrast to their own dark and comfortless homes, and they spent a large portion of their earnings in this manner.

Rev. J. B. Owen thought that, considering the vast number of dwellings of the industrious classes that had been removed in and about London for railway purposes, it should go forth as a suggestion from this Conference, that, upon the principle of compensation recognised in all other matters, railway companies were bound to provide cheap trains, at such hours, morning and night, as would enable the labouring classes of towns to occupy suburban dwellings, by means of which a vast amount of the evils arising from crowded habitations might be obviated.

Mr. John Brooke said it had been feared that, in building larger and more commodious houses for families, the people would avail themselves of the opportunity of taking lodgers, but he apprehended it was quite within the power of the landlord to obviate that evil.

Lord Lyttelton remarked that the extreme multifariousness of the subject made it difficult to deal with it, in a satisfactory way, on an occasion of this kind, nor would he attempt to do so. With regard to the law of settlement, it was only one branch of the poor law. Many years ago Mr. Coode wrote a very excellent report on the laws of settlement and removal, in which he simply recommended the abolition of the law of removal, leaving the law of settlement as it was, the effect of which would be that no poor person could be removed without his own consent. The law of settlement gave the right of relief in one place, and one place only; therefore, in parishes which had numerous habitations for the poor, the rates were much higher than elsewhere, and there was thus a discouragement to owners of property to erect cottages which might increase the rates upon that property. This was, doubtless, the effect of the law of settlement, but to alter this state of things was by no means so easy, and his conviction was there was no medium between the present law and a national rating for the relief of the poor; a mere enlargement of area would not, in his opinion, be sufficient. Lord Malmesbury, Lord Berners, and others, had proposed a national rating, but there was great difficulty in the way of adjusting that question. Since the alteration of the poor law, however, Parliament had in some degree extended the area of rating for particular purposes, and there were several charges, such as those for vagrants and pauper lunatics, which were now thrown, not on parishes, but on unions, and, as far as he had observed, the evils which were expected by some from that system had not followed. He thought it desirable to go on in the same direction with regard to the rating for the poor. No doubt, as to the obstruction to cottage building, a national rate would be an effectual remedy, because in that case it would make no difference to the owners of property whether they had many cottages or few. A very able article lately appeared in the *Saturday Review*, in which it was proposed to abolish the whole law of settlement and removal entirely, and replace it by one short Act of Parliament, which was very ingeniously sketched out. The principle on which it was based was undeniable, viz., that the support of the labourer ought to come out of the proceeds of his labour, and that he should, therefore, be relieved by the parish where he had laboured for a certain time. But the question was whether this would not lead to as much litigation as the present law. For the purposes of this conference they might pass a resolution as to the undoubted effects of the law of settlement on the building of cottages. He should have no hesitation in supporting such a resolution, from a conviction that the utmost freedom of the circulation of labour would be beneficial to the labouring man. He would say one word as to the effect on towns of the destruction of house property by the invasion of railways and other public works. The great and deplorable mischief, as regarded the metropolis especially, was that whole blocks of buildings occupied by the poor were removed to make room for modern improvements, and the people driven from them without anything being done to provide them dwellings elsewhere. That question had been brought before Parliament by Lord Derby, and he had hoped something would have been done in it, but it had been passed over. There could be nothing more unobjectionable than an expression on the part of this meeting that Parliament should make it obligatory upon public bodies and railway companies in the prosecution of their works to leave the poor, with regard to their dwellings, at least in no worse position than they were before. This was attempted by the Commissioners of Woods and Forests some fifteen or sixteen years ago, in the same way as with a Common Inclosure Bill, that some part should be given over to be reserved for the benefit of the labouring classes as land; and when a railway took a given amount of land, nothing would be easier than to require that, in the apportionment of that land hereafter, there should be a reservation of a portion for the dwellings of the poor on that spot, and that those dwellings should be built under proper sanitary and social ar-

rangements. That must, undoubtedly, be a question of legislation. Railway companies might be compelled to run cheap trains for the working people at given times; and, where they dispossessed the poor of dwellings, a proportionate number of houses should be provided elsewhere, under proper sanitary rules. He should be glad to support a general resolution to the effect that the law of settlement acted unfavourably on the erection of dwellings for the poor, and that the provision of dwellings, in the place of those removed, should, in many cases, be made imperative.

Mr. HARROLD attributed the present state of things mainly to the effects of the law of parochial settlement. Large numbers of cottages were often pulled down in order to relieve the rating of parishes. The object was to keep down the parochial rates as much as possible, inasmuch as the contribution to the union rates depended upon the amount of the parochial rates. The consequence was frequently, that parishes which could best bear the burden had the least to pay. In parishes belonging to a single landlord, and occupied by one or two tenants, there was no poor-rate at all. If a family became destitute, the landed proprietor would support them rather than pay rates, and in such instances they did not contribute a farthing to the union rating. A committee of the House of Commons sat on this question some time ago, when valuable evidence was given by a parochial officer of Louth, who suggested that instead of parochial settlement there should be a union settlement, and he (Mr. Harrold) thought, if that plan were adopted, one great difficulty in this question would be obviated. There was this objection to the present system, that where persons were liable to be supported by a single parish, they might not be good workmen, but still the farmer must find work for them, as it was cheaper to do so than to support them in idleness out of the parish rates; but if the system of union rating were adopted, it would not be to the interest of occupiers to employ indifferent labourers.

Mr. FREDERIC GOLDSMID, while agreeing in the effects produced by the law of settlement, questioned whether a remedy would be found under a system of national rating. The true evil was the inadequacy of wages. In the manufacturing districts the wages were from 25s. to 30s. per week, while in Dorsetshire, Wiltshire, Kent, and other counties they did not exceed 10s. or 12s. per week. Under such circumstances they must see the utter impossibility of labourers paying sufficient rent to provide themselves with proper dwellings. He thought it was quite a mistake to argue this question on the ground of benevolence, and they could not hope for an adequate supply of dwellings, either in town or country, upon the principle of philanthropy. It would be destructive of the feeling of independence which was innate in working men, and would tend to make them a community of paupers.

The CHAIRMAN then submitted the following resolution, as expressive of the opinion of the meeting on these points:—

"That in the opinion of this meeting the present lamentable state of the dwellings of the labouring classes is materially induced by the Law of Settlement and the limited area of Poor-law rating."

The CHAIRMAN then invited discussion on the next two subjects, under the head of "Causes," viz.:—"Tenure of Property" and "Legal difficulties affecting the Transfer of Property."

Mr. THOMAS HARE said on these points, to which he had paid considerable attention, a discussion had taken place at the Law Amendment Society, under the presidency of Lord Stanley, and he might add that the draught of a Bill had been prepared, the leading provisions of which he hoped to bring before the meeting when they came to the discussion of the "Remedies." They were now considering the effects of the want of a prime necessity—a place for repose, decent association, and where a family could be brought up with something like home feelings. Why was it that to the present day the progress of industry, and the vast wealth produced by labour, with the vast wages fund of the country—how was it that these could not be brought to bear to provide this article of prime necessity? It was mainly this, that the laws of the transfer of property stood in the way of enabling the working classes to obtain this necessary requirement. Take the cases of an engineer, or the foreman of a workshop, or workman of superior or inferior rank, what was the position these were placed in? Take the dock-labourer, earning 18s. a week; he must live within moderate distance from his work, and he was obliged to pay 2s. or 3s. a week for a single room in which he and his wife and children must live. Why was he bound to pay that extravagant price for a single room? He had not only to pay the fair return upon capital, but was obliged to contribute for those of his own class, who did not pay at all, or who actually injured the property. He had to pay for the repairs necessary on a change of tenancy, and, in addition, he must pay for the collector who took the rents. There were also legal expenses and ejectments, besides legal expenses in the case of defaulting tenants. All these things were charged upon the poor tenant, and these he would escape, if instead of being the tenant of another, he were his own tenant. Whence arose this difficulty? It consisted in the laws relating to the transfer of property. In the transfer of merely a suite of rooms in Lincoln's Inn £50 was very easily expended. He thought they were in a position now with regard to property which enabled them to commence a better system. Under Lord Westbury's Act they could have an undefeasible title by registration. Suppose they took a plot of ground, they could obtain an indefeasible title from the Land Transfer Office, and they need not go back farther than that title. Upon such plot of land they could erect blocks of houses with numerous stories, each floor varying in rent as they went higher up, so as to suit all classes of occupants, and these floors might be conveyed each in a separate page of the register to different owners. It was found by experience that chambers erected in this manner would cost only 9d. per cubic foot. If they had 2,000 cubic feet in two rooms, that at 9d. per foot would amount to £75, adding £25 as the proportion for expenses of land, they had a total of £100, and for that £100 the two rooms might be purchased by the working man by the process adopted by building societies, so as to be abundantly profitable to him. By the payment of 3s. per week he became the immediate possessor, and in fifteen years he became the owner of those premises, in addition to paying 6 per cent. on the capital expended. This plan was no novelty. It had been practised for centuries in Hamburgh, Bremen, and other cities, and in the Hanse towns they had had no transfer deeds for the last 500 years. The register was kept, and in that the transfers were made, and they recognised no other title or trust than appeared on the page of that register. By the abolition of the present system of legal conveyance as affecting this class of property all the better class of workmen, out of the great wages fund of the country, might become the owners of such places as it would be a pleasure to them to live in. It was a plan which he thought would suit all classes of the labouring population, who would reside together as convenience enabled them to do. It was a plan suited alike to the poor workman and to people of a higher grade, such as bankers' clerks, &c. The number of letters he had received from the latter class was enormous, setting forth how great the benefits of such a scheme would be to them. This Conference would, therefore, be quite right in saying that the law of transfer of real property stood in the way of the working classes becoming possessors of that article of prime necessity—a proper house to dwell in.

Lord LYTTELTON had no doubt the views of Mr. Hare on this question were quite correct. The law of transfer of real property was a great point in the consideration of

this subject. The system propounded by Mr. Hare was applicable to dwellings for the poor, because only recently Parliament had passed a statute affecting the transfer of property on a larger scale. At the same time, the plan laid down was so simple and obvious in its nature, that it was by no means one of the most difficult parts of the subject to deal with. Mr. Murphy had said, if they had good people they would get good houses; on the contrary, it was a lamentable part of the subject, that people who would appreciate good houses could not get them without paying an exorbitant rent. Most landlords were desirous of doing what they could in the way of religious teaching, but he had been told by a clergyman that they might do all they could, but the single bedroom beat them. Birmingham might be mentioned as a town presenting a remarkable exception to the general crowding of the population. It was part of the habits of the people. The town was full of small, ugly houses, which would accommodate poor families, and not more than one family dwelt in a house. That was in itself an enormous advantage, and contributed to the better sanitary and moral state of that town.

Mr. H. W. Freeland remarked that he resided in a district where there were a great many cottages and other property held on church leasehold tenure. The noble lord who had just addressed them was no doubt aware that whenever the leases had to be renewed a revaluation took place. Every single cottage was subject to a revaluation, with a view to the fine, or, if enfranchised, with a view to the enfranchisement; and that valuation did not depend upon the rent paid, but upon what was in the opinion of the valuer the improved value of the property. A landlord who had made improvements in his cottages was liable at each revaluation to pay not only according to the rent, but according to what the valuer thought the rent ought to be. Therefore, as a matter of pecuniary interest, it was not to the advantage of the proprietor to improve his property. In addition to this there was a large amount of property held under municipal corporations and trustees of charities. In his own district he had many cottages held under the church tenure, and all these incidents of tenure were a considerable bar to improvements. If the districts of the country where this tenure prevailed were gone through, it would be found that poor dwellings held under this tenure were in a much worse state than those of freehold tenure. If the fact were as he had stated, it seemed to him exceedingly desirable to give—he would not say additional facilities for enfranchisement—but some compulsory system which should compel the enfranchisement of all these dwellings held as renewable leaseholds, whether under ecclesiastical or lay corporations or charities, upon a fair basis, with the right to call for arbitration in disputed cases.

Sir Christopher Rawlinson, without denying what had been stated, viz., that church property was generally found in a bad condition, and that corporation property was much neglected, said he would not admit that to be a question for discussion on the present occasion. If they adopted the simple provisions of Lord Westbury's Act, all difficulties of tenure of property would fall to the ground. Mortmain did not affect the question—church property might be enfranchised, and was now beginning to be brought into as good condition as other property, and the same remark applied to college property. Without denying there were great evils connected with those tenures, they ought not to encumber so practical a question as that which Mr. Hare had introduced with a discussion upon the reform of the law of tenure generally. The legal difficulties of transfer were wholly removed by Mr. Hare's suggestions, and he (Mr. Rawlinson) believed it was not the question of tenure that affected the cottage system. It might be that the tenant for life of an estate did not like building cottages. In the south of England he found freehold cottages in as bad condition as those on the estate of a tenant for life. If they asked the reason, in nine cases out of ten they would be told that private gentlemen could not lay out money for improvements which would return them only 3 or 4 per cent., but he was satisfied they must come to it eventually, as men of good capital would not take farms—as was now the case in the north of England—unless there was a proper supply of labourers' cottages on the estate.

Rev. T. Pyne thought the legal difficulties attending the transfer of property were a hindrance to improvements in the direction sought. The expenses attending the transfer of small properties were such as to deter persons from entering upon the purchase. He thought the leasehold system was very injurious. If they could give a fee simple in cottage buildings it would do a vast amount of good in adding to the comforts of the poor in respect of their dwellings.

The Chairman then read the following resolution, which was carried:—

"Resolved that the tenure of property and the legal difficulties attending its transfer, and the obstacles they interpose in obtaining sites, impede the labouring classes from becoming possessors of suitable dwellings, either as separate buildings or as portions of larger buildings."

The Chairman then invited remarks on the remaining proposition under this head, viz.:—"The difficulty of providing proper dwellings at a cost which will be remunerative to capital in town and country."

Lord Lyttelton remarked that no doubt the question now propounded was one great difficulty of the subject, viz.:—The interest to be obtained upon capital invested in this description of property. The want of capital on the part of landowners was not the great difficulty, for the Lands Improvement Company had ample powers to advance capital for the purpose of constructing cottages as well as for other improvements of estates; but under ordinary circumstances it was almost impossible to get sufficient rent to make it worth while in a pecuniary point of view to build these cottages.

Mr. Westgarth thought the principle of association, which had been found to work so well in other directions, might be beneficially applied in the present case. No doubt the feeling of most Englishmen was to have an independent home, but if they could not effect that to the full extent they desired, they might, by the principle of association, greatly increase their home comforts. Mr. Westgarth proceeded to lay before the meeting a plan for large buildings, containing four or five floors, and capable of accommodating 200 or 300 persons with the most approved sanitary arrangements, which he said could be obtained by the moderate contributions of the many. In such buildings he proposed that there should be a large hall common to the inmates in general. He attached as much importance to the hall as to any point in the plan, as being a counterpoise to the public-house. Having also advocated a large kitchen in common, he added that Mr. Corbett, of Glasgow, had shown what could be done by the pence of the many in procuring the best articles of food at the cheapest rate. He thought, if those principles were adopted, the saving to a working man with a family would be one-third, and to the single man one-half of the present cost for the necessaries of life. He was much gratified to find that the results arrived at by Mr. Hare entirely corresponded with his own views, particularly with regard to that great want of the working man, viz., two good rooms to live in, of which he might possess himself at a cost of £100. Those buildings, he said, might be carried out by joint-stock companies, and his calculations were that, after providing for repairs, insurance, and public rates, the property would give a return to the promoters of 6 or 7 per cent.

The Rev. A. W. Thorold remarked upon the value of land in large towns as materially affecting the costliness of dwellings for the poor. In the outskirts of London, a cottage might be obtained at the same rate as was fixed for two rooms in the centre of London, where house property was of the greatest

value. In the vicinity of Covent-garden costermongers paid as much as 8s. or 9s. a week for their rooms, though they might get a good cottage at Camden-town for the same money. Just at the present moment the metropolitan railways and street improvements tended very much to complicate the question before them, as they took away so much space that was formerly occupied by the dwellings of the poor. The construction of New Oxford-street dispossessed a poor population of 4,000 of their homes, and as they could not leave the neighbourhood where their employment lay, the result was they were more densely crowded than before; and the last census showed that the population of that quarter of London was diminished by only 80. The new street from Tottenham-court-road to St. Martin's-lane would dispossess a population of 2,000 of the working classes. No doubt it would do much good in removing a great number of dirty, ill-ventilated dwellings, but whither were the poor inhabitants to go? The more houses they pulled down the more they dispossessed a class of the population who were compelled to live within a certain centre. The great question then to be considered was the provision of other sites and the erection of other houses for the people thus dispossessed of their former dwellings. He was glad to find, from what had been stated, that the poor were becoming impressed with the necessity of having two rooms at least, and instances had come under his own knowledge in which men had deprived themselves of beer in order to secure that amount of accommodation for their families.

Mr. Alderman Waterlow said he thought the more this subject was ventilated by persons desirous of striving to ameliorate the evils which exist the more would be accomplished; though there were difficulties in the way, these difficulties might, with faith and earnestness, be easily overcome, and in reference to these some experience had already been gained. The first thing was to show that a moderate dividend might be derived from improved dwellings for the working classes. He might be told that the Metropolitan Association, which had laboured for so many years, and the Society for Improving the Condition of the Labouring Poor, had failed to pay even a moderate dividend; but he thought they ought to recollect that those who first put their hands to a great work too frequently failed to accomplish their object; but the experience they gained was often of great value to those who followed them. He had little doubt that any society starting now, and avoiding the mishaps which others had fallen into, would pay a moderate dividend. He made that assertion upon facts and figures, the latest of which were the accounts of the Society for Improving the Dwellings of the Labouring Classes; the net earnings of their houses varied from $1\frac{1}{4}$ to $14\frac{3}{4}$ per cent., and gave an average of 4 per cent. If that society, which started when there was a duty on glass, and when there were many Acts on the statute-book which interfered with building operations—if that society was able to pay a dividend of 4 per cent. in spite of all mistakes, any society of this kind starting now ought to pay an average dividend of more than 5 per cent. He made this assertion on his personal experience and upon the experience of the company of which Lord Stanley was chairman—viz., The Improved Dwellings Company (Limited). They might say that company was not yet paying a dividend, and therefore the statement was not a fair one; but that company was building blocks of dwellings on the same plan as those which had been in existence for more than a year in Finsbury. That society had already contracted for four blocks of buildings. They knew the amount of the contract, the amount of ground rent, as also the parochial rates, water rate, &c., of the entire buildings, and they could tell almost to a fraction what the return would be. Those blocks were now erecting; three at Wapping, near the docks, where there was a large working population, and one in the new street at Southwark, both good sites and certain to command good tenants. The calculation of the gross returns was $12\frac{1}{2}$ per cent., subject to a reduction of 40 to 45 per cent. for expenses, the estimates of which were based upon the experience of the Metropolitan Association, making the net returns about 6 or 7 per cent. Those figures were supported by the results of the best experiments of the Metropolitan Association, viz.:—the blocks they had erected for families. He was justified in taking the most favourable experiments, because if the Association had more capital they would imitate these. The buildings at St. Pancras were erected at a time when the expenses of construction were greater than they were now; and if they had to build them over again, erecting them so as to avoid the house-tax, they would pay the society over 5 per cent. He believed they now paid $4\frac{1}{2}$ per cent. whilst subject to the house duty from not being built with open galleries. It was most important, in laying out these buildings, that they should bear in mind all the points which led to increase of taxation, because taxation—especially that of a local character—bore very heavily upon all these experiments. A gentleman opposite (Mr. Westgarth), in speaking of buildings to be erected by associations of the working classes, suggested a square form, in which 200 or 300 families would be provided for. He thought that was objectionable, inasmuch as the persons who occupied these buildings had no desire to be massed together in one spot. He thought small sites preferable, in which forty or fifty families only could be accommodated, while the adoption of larger sites looked like a desire to isolate a particular class of the community. Another point in erecting dwellings for the industrial classes, was to make each home as separate and distinct as possible. The better members of the labouring class had a horror of community in domestic life: and it was found that when anything was provided in common it was certain to give rise to disagreement. On that ground he objected to the proposition for a hall and kitchen to be used in common. It was opposed to the present feelings of the English working man, who preferred to sit down quietly amongst his own family. He thought that was a feeling which should be cultivated rather than discouraged, for when he saw a young man driving a perambulator containing his children, accompanied by his wife, or carrying his children in his arms, he put that man down to be a good member of society. They had to thank the legislature for the facilities afforded to association by the passing of the Limited Liabilities Act, and under such facilities they should endeavour, each person in his own district, to provide for the particular wants of that district. In order to illustrate his meaning, and give practical evidence of what might be done, he had been fortunate enough, within the last month, to start a society in his own district of Highgate. Less than a dozen gentlemen met, and at that meeting an association was formed, and a capital of over £3,000 subscribed. At the succeeding meeting the Articles of Association were agreed to, and at the next meeting the Company would be incorporated—all of which had been done at an expense of less than £25, paid by voluntary contribution, thus leaving the entire capital free for the purposes of the company. The day was past for high fees in connection with these objects. He would add, that in both the companies he had assisted in forming, professional gentlemen had offered their gratuitous services to aid in promoting the object. Associations in various parts of London might be formed in this way at very little expense, and great advantage resulted from a local knowledge of each district, in the acquaintance with and the selection of sites suitable for the purpose, and in that way he was persuaded a great deal might be done towards remedying the evils they were met to consider. There was one point he could not help alluding to, as tending to increase the difficulty of building houses for the working classes in towns—that was the tendency of the architects, in designing dwellings of this class, to make them of too ornamental a character. Every man

naturally took a pride in the profession to which he belonged; but if the working man was to be kept independent, and not made the recipient of charity, the architects must lend their aid in designing buildings which would give the utmost amount of accommodation for the smallest amount of money. He did not say that a cheap thing must necessarily be ugly, but he would ask architects to consider economy in material, in their design, more than they did at present. Frequently a pretty building was designed, but the materials were wastefully employed; for instance, eight-inch joists might be ordered, where seven-inch battens would cut to much better advantage. In illustration of these remarks he would add that two schemes were now in progress—one in the City, and the other in the new street in Southwark. The erection in the City consisted of basement, shops, and five stories, that in Southwark of basement, shops, and four stories. The elevation of each was about the same, and the rooms were within an inch or two of the same dimensions. There were the same number of rooms in each floor; the frontage of the City blocks was 56 feet, and that of the other 60 feet, and yet those blocks, the tenders for which were let within a month of each other, would cost, the former £701 per floor, and the latter £505 per floor. He had no doubt, when they were finished, the one which cost £701 would be the more ornamental structure of the two; but when they were working for the labouring class they were not justified in spending so much in ornament. If they kept this in view, many of the difficulties hitherto in the way of providing dwellings for the labouring classes would be got rid of, and capitalists who invested their money in these undertakings would find that they would get a fair return for it.

The Chairman said he had been informed that the £505 per floor was a private tender, whilst the £701 was the result of public tender.

Mr. Henry Maynard remarked that he had indulged in cottage building as an amateur, and, like others, had found it expensive. He was pleased to hear the opinion of Alderman Waterlow, that 5 per cent. would be returned upon investments in dwellings for the poor. Although his own cottages had not brought him anything like that return, he was led from experience to believe, that by association and a due regard to the details of construction, dwellings of this class might be made to yield a fair return. He had not undertaken what he had done in this direction with a view to pecuniary profit, but rather with a view to indirect advantages resulting from the improved condition of the occupants of the cottages, and the benefits to the rising generation, added to which was the feeling of gratification which was created by having done something in what he conceived to be a right direction. He thought too much importance was given to making these undertakings commercially profitable, to the too great exclusion of the collateral benefits that were to be looked for. The great object was to remove every barrier to the improvement of the people, and no barrier was so great as the want of proper dwellings for the exercise of the domestic virtues. Mr. Maynard, following up the arguments that cottage property might be made to yield a fair return, referred to the successful operations of the Land Company of Canada, which was based upon similar principles to those which had been propounded to the meeting. He then alluded to the Cottage Improvement Society of Hastings, in which the capital invested amounted to £17,000, the report of which showed, he believed, that an average of 5 per cent. was returned; and he was of opinion that an institution formed under the auspices of this Society, paying a dividend of 4 per cent. in half-yearly instalments, would meet with abundant support. He thought, from what they had heard to-day, there was every encouragement to proceed in this work, for they had never found that any well-planned project for the improvement of the moral and social condition of the people of this country had been long without supporters.

Dr. Greenhill said that as the preceding speaker had particularly mentioned one of the societies with which he was connected (the Hastings Cottage Improvement Society, Limited), he would give very briefly the result of his experience in this matter. His attention was first drawn to the subject many years ago by the fact that by far the greater proportion of the deaths from fever and other zymotic diseases were found to occur in those parts of a town which were most deficient in cleanliness, good drainage, &c. Upon consideration he came to the conclusion that the most effectual way of remedying the evil was to purchase as many as possible of these places, in order to cleanse and purify them; and accordingly he joined nine other persons in getting possession of one of the worst courts in Oxford, where he then resided. They succeeded in improving the condition of that particular court; but the experiment could not be considered as entirely successful, inasmuch as it had not been thought worthy of imitation elsewhere. It had, in fact, been conducted on an entirely erroneous principle, which contemplated the probability of an annual loss to the subscribers, instead of a moderate interest on their capital. Some years afterwards he resolved to make the same attempt at Hastings, with this important alteration, viz., that the necessary capital should be subscribed, not as to a charity, but simply as an investment. The Hastings Cottage Improvement Society was founded more than seven years ago by a few personal friends, and commenced its operations with a capital of £750, which was invested in the purchase of ten poor cottages. It was successful from the very first, and increased so rapidly that the capital now amounted to £17,000, wherewith more than thirty purchases of freehold property in some of the worst parts of Hastings had been made. It was now larger than any similar society out of London, and the cause of this very unusual success was to be attributed in a great measure to the fact that the shareholders had regularly received a half-yearly dividend, at a rate never less than 5 per cent. per annum. As a comparison was often made between the building of new houses and the repairing of old ones, it might be mentioned that at Hastings the latter mode of proceeding, which had been chiefly followed, had been found slightly more remunerative than the former. The success of the Hastings Society, when so many others, both in London and in the provinces, had failed, naturally attracted much notice, and induced some of the shareholders to repeat the experiment in the metropolis. Accordingly, rather more than three years ago, the London Labourers' Dwellings Society (Limited), was established, and commenced its operations in the parish of St. George's-in-the-East, near Wapping and the London Docks, where it had expended upwards of £10,000, and possessed nearly 100 freehold and leasehold houses. The shareholders had received a regular half-yearly dividend, and also a bonus, equivalent together to 5 per cent. per annum; and the directors were now anxious to extend their purchases to other parts of London, and to issue additional shares in order to enable them to do so. As the necessary expenses connected with this sort of property had been mentioned by Mr. Waterlow and others, and also in the valuable "Report on the Statistics of Dwellings Improvement in the Metropolis," lately issued by the Society of Arts, Dr. Greenhill said he would give the result of an analysis of the expenses of seven London societies established for the improvement of dwellings of the labouring classes; and he was the more anxious to do this, in consequence of the great misapprehension that existed on this subject, arising from imperfect calculations, and especially from the omission of an adequate sinking fund in the case of leasehold property. Hence arose the expectations of a net rental of 14 or 15 per cent., which were sometimes held out to the inexperienced, and the subsequent disappointment that must invariably ensue to any person who managed his property prudently. From the *nominal* gross rental of house property a deduction should first be made for losses arising from empty tenements and bad debts. The

amount of this deduction varied very much in different places; but perhaps it ought not to be reckoned in London on the average at much less than 10 per cent. From the gross rental actually received from the tenants the following charges would, in all cases, have to be paid—viz., 1, rates and taxes; 2, repairs; 3, insurance; 4, collector, &c.; and 5, miscellaneous; to which, in the case of *leasehold* property, would have to be added, 6, rent; and 7, sinking fund. Some of these items of expense were quite beyond the control of the landlord, while others might be increased or diminished almost as he pleased. 1. The rates and taxes varied very much in different parishes, and were, for the most part, beyond the landlord's control, except in so far as he was able to relieve a large block of buildings from the house duty, by constructing it with external galleries, as pointed out in Mr. Rigby's Report. The average deduction for rates and taxes in London had been about 16 per cent, and had formed the most important item of expense. 2. The repairs had been about 11 per cent. in the case of the societies alluded to; but they might vary at will to almost any extent. And here a builder would have a great advantage over an ordinary landlord, as he would be able to execute his own repairs at his own convenience, and in the most economical way. 3. The charge of insurance had been about 2 per cent. 4. The cost of collecting, &c., had been about 8 per cent., but this, in several instances, was mixed up with the expensive machinery required at a lodging-house. In ordinary cases, it need not amount to more than 5 per cent.; and here also a person who collected his own rents, or who employed one of his own clerks to do it, would have an advantage over every other landlord. 5. The miscellaneous expenses had amounted to about 6 per cent., but here again the average had been swelled by the numerous items connected with lodging-houses, &c. In the case of ordinary cottage property, the sundries probably need not exceed 1 per cent. These five items of expense, which might be considered ordinary and universal, had amounted, on an average, to about 43 per cent., which might be a guide, to some extent, both to societies and individuals, as to what the necessary expenses of freehold house property had really been found to be. In the case of leasehold property a further deduction would have to be made, both for the rent and also for the sinking fund, both of which items would, of course, vary in amount to a great and indefinite extent. The latter item was indeed very frequently omitted altogether, and it was this omission that had in a great measure given rise to the exaggerated and fallacious statements above alluded to, which seemed to require especial notice on this occasion.

Mr. H. W. Freeland concurred in the remarks as to the desirability, in many cases, of renovating existing buildings rather than seeking to build new ones, the cost of which would not give an adequate return. He also entirely concurred in the suggestions of Mr. Alderman Waterlow, as to the principles on which dwellings for the working classes should be erected. Each home should be made as complete as possible in itself, and regard should be had to furnishing the largest amount of accommodation at the least cost, more than to mere architectural decoration. In dealing with the subject of remuneration, they were dealing with the pith and marrow of the question. Mr. Dillon had truly said that self-interest was the great moving spring of human action, and if they invited operations on a large scale they must look upon self-interest as the moving power. What did they mean by remuneration? If they meant a large direct return in the shape of rent for the outlay, he feared that, in many cases, they would meet with disappointment. Lord Berners had spoken of the extreme desirability of having improved cottages erected by proprietors, but at the same time his lordship added he believed they could not be made commercially remunerative. Still the noble lord was of opinion that it was to the interest of proprietors to erect good dwellings for the labouring classes. To get at his meaning they must look at this question in two points of view. There was the direct remuneration to be got in the shape of rent, and that was no doubt small; but if they went a little further, and looked at the indirect benefits, if not in money, in money's equivalents, which they derived from the improvement of cottages, he thought that they were very large and too generally under estimated. Let them look at the indirect benefit in connection with health. They might not derive a large rental from giving the labourer a healthy home, but they got a better day's work from a healthy labourer than from a man who, dwelling in a comfortless and ill-ventilated cottage, was not so fit for work as he otherwise would be. Sickness, too, was one great source of the increase of the poor-rates, and if they provided healthy homes they not only had healthy labourers, but they diminished the poor-rates *pro tanto*. Again, looking to the question of the benefit of near residence, was not the labour of a man residing on the spot worth more than that of one who had to walk a long distance to his work? Then again, what was the source of crime which cost so much to the country? One reverend gentleman had said it was the beer-house, but the labourer was often almost driven to the beer-house by the wretched state of his home. If they provided healthy homes it would tend to keep men from the beershops, and a proportionate diminution in crime, and in the cost of crime, would be the result. Let them add, if possible, outlets, that children might be kept from the streets, where a career of crime often commenced in a series of petty larcenies. There was another point, namely, the great and growing cost of pauper lunatics; not to go into the many causes of lunacy, money difficulties being a frequent one, he believed that the minds of these people were materially affected by the miserable condition of their homes, which might act most unfavourably upon a sensitive mind, and become a predisposing cause of insanity, by which the poor rates in many districts were materially increased. What he asked the meeting to consider was whether the indirect returns they got in all these ways from the improvement of the dwellings of the poor did not more than counter-balance any deficiency in money return, in the shape of rent, upon the outlay, which their duty to society called upon them to make.

After a few words from Mr. Westgarth, in reply to the objections of Mr. Alderman Waterlow as to the form of building he had recommended,

Mr. Mortimer remarked that this was entirely a builder's question, and proceeded to point out, aided by the illustration of drawings, the prejudicial operation of the existing Building Act for the metropolis. He thought the remedies would be of a very limited character whilst that oppressive enactment remained in force.

In reply to a question from Mr. Murphy,

Mr. Alderman Waterlow replied, that the topmost storey of the three blocks of buildings to which he had referred, had brought the largest number of applicants. The roof was constructed as a drying ground, and on that account ready access to it was a desideratum with the tenants. The dimensions of each floor were uniform from the top to the bottom of the building, and a slight reduction of rent was made for the top floors.

Mr. Gatliff mentioned, as the result of the experience of the Metropolitan Association, of which he was secretary, that the most unprofitable part of their operations had been the building of lodging houses for single men. This had been a considerable clog upon the profits of the association. They had expended about £15,000 in those buildings, which did not return more than a ½ per cent., while the family dwellings gave a return on the average of 5 per cent. More recently-erected family dwellings had paid upwards of 6 per cent. With regard to the security of these investments he added that during the last twenty years the association had received £90,000 in rents, and the bad debts had not amounted to a ½ per cent.

The Chairman then read the following resolution as representing the opinion of the meeting on this head of the subject:—

"That by proper attention to economy, by building to the extent only required by each district, and by the utmost care in avoiding unnecessary outlay in preliminary expenses, proper dwellings for the labouring classes can be provided which will realise in towns a fair dividend on the capital expended; and that although in rural districts, commonly speaking, the pecuniary return for capital invested in labourers' dwellings, considering the rate of their wages and their general circumstances, and the cost of repairs, can only be moderate, yet it may be regarded as satisfactory, when the consequent improvement of the character of the occupants, their comfort, their health, and the additional value of their labour are taken into account."

In submitting this resolution, the Chairman added, he had intended to offer some remarks on this part of the subject, as he confessed he did not agree with some of the views expressed in the course of the discussion, although he believed the resolution fairly represented the feelings of the meeting. He would, therefore, take the opportunity of saying a few words at the next meeting to relieve himself of any apparent inconsistency with respect to this resolution.

The above resolution having been agreed to, the meeting adjourned to the following day (Friday). The report of the proceedings of Friday's meeting will be given in the next number of the *Journal.*

Proceedings of Institutions.

Bacup Mechanics' Institute.—On the 18th of May, a large audience assembled at this Institution, to witness the distribution of prizes to the successful competitors connected with the various classes. Samuel Hall, Esq., one of the vice-presidents, occupied the chair, and distributed the prizes. Those gained by females were for reading, writing, arithmetic, grammar, and domestic economy. Those to males were for reading, writing, arithmetic, dictation, grammar, analysis, geography, chemistry, phonography, and general proficiency. The Victoria Glee Society gave musical selections, one of which, "The Country Schoolmaster," was in character, and gave great satisfaction. The members of the reading and elocution class delivered several Shaksperean and other pieces. The examination proved that the pupils had acquired considerable proficiency in their various studies. Votes of thanks were carried by acclamation to Mr. S. Hall, Mr. H. Maden, and Dr. Worrall, who were donors to the prize fund. Thanks were also cordially passed to the examiners, the singers, and the chairman.

Glasgow Mechanics' Institution.—On 17th of May the prizes awarded to the successful competitors in connection with the above Institution were publicly distributed in the large hall. In the unavoidable absence of the Lord Provost, the chair was occupied by Bailie Couper, and there was a good attendance. The Chairman having made a few remarks, Mr. J. McDougall, Secretary, read the forty-first annual report by the directors, of which the following is an abstract:—The various departments of instruction have been prosecuted with vigilance, and the results of the session now closed are quite equal to those of its predecessors. One or two new classes have been established in important subjects, which have been, to some extent, appreciated. Reports are given of the various classes, the first alluded to being the dancing and calisthenic class (Mr. Duncan Sinclair), the result of which has been encouraging. In the Greek and Latin classes (J. Miller, A.M.) the progress made by the students was most satisfactory, and their conduct and diligence were highly gratifying. During the session the number of tickets sold for the Spanish class (Mr. Archibald Revie) was 44. The attendance upon the whole has been well sustained. In the German class (Herr Rehbann) the teacher expresses satisfaction with the real progress made. The course of instruction pursued in the French department (Mons. Dutoit) is for gentlemen in business, and others who require to learn quickly and yet thoroughly the French language, and both junior and senior classes have acquitted themselves well. The mechanical drawing class (Mr. Peter Stewart), which is of so much importance to the artisan, has completed a very prosperous session. The course of lectures in botany (Mr. W. Keddie) embraced the outlines of vegetable structure and physiology, but the greatest portion of the time was devoted to systematic botany. The interest in the subjects treated in the class-room was enhanced by a series of botanical excursions. The lecturer had every reason to be gratified with the proficiency of the class. There were 34 students enrolled in the geological class (Mr. Thomas Struthers), and a course of eight weekly illustrated lectures was delivered. There were also six excursions to localities geologically interesting. The course on animal physiology (Mr. John Mayer) has embraced a very extended outline of the principles of physiology, given in the form of lectures and demonstrations, and supplemented by frequent examinations. In music (Mr. Samuel Barr) the teacher expresses himself as highly pleased with the general progress of his pupils. In the English grammar, composition, and literature department (Mr. Robert B. Smith) the students were this year divided into two classes—an elementary and an advanced, and the master bears testimony to the attention, progress, and exemplary conduct of his pupils. The students in arithmetic and mathematics (Mr. H. M. Ashcroft) were, as usual, arranged into a junior and senior class. As regards attendance, diligence, and real progress, the session was a highly satisfactory one. In practical mechanics (Mr. J. P. Smith, C.E.) the number of students enrolled is about 70, and the average attendance during the first quarter was about 65. Since then there has been a gradual falling off of those who had entered the class without any previous knowledge of mathematics or mechanics; the numbers attending recently had been from 30 to 40. In natural philosophy (Mr. Thos. Johnston, surgeon), the lecturer took up as his subject, force, motion, simple machines, &c., illustrating leading principles by experiments. The lectures on chemistry (Dr. W. Wallace, F.R.S.E.) treated of the fundamental principles of the science, together with the study of the non-metallic elements and their compounds. Several written examinations were held during the session. In the writing, arithmetic, and book-keeping department (Mr. John Mac Gregor), the past session may be considered a highly prosperous one. In arithmetic the students were, as usual, taught in two divisions, junior and advanced. In writing, instructions were conveyed to the class by means of the black board. In book-keeping there was a large attendance. The junior students of the drawing, painting, and architecture class (Mr. A. D. Robertson) were, as formerly, exercised in geometrical and outline drawing of elementary forms and simple examples of Greek and Roman ornament, also outlines of flowers and portions of the human figure. The senior students, in ornament, landscape, flower, and figure, had the principles of generalisation, composition, chiaro-scuro, and colour explained to them. In the architectural division, the students produced highly creditable drawings of classic and Gothic character. The attendance and progress have been perfectly satisfactory. The elocution class (Mr. Harcourt Beatty Bland), which numbered between thirty and forty students, showed great zeal and attention. The average attendance was about twenty-two. In presenting the second annual report of the "Middle Class School" (Mr. R. B. Smith, head master), the directors give a highly satisfactory

account of the session. The number of pupils enrolled is 274. The English department, conducted by the head master, assisted by Mr. John Rathbone, A.M., and the lady superintendent, has been attended by 238 pupils. These, as last session, were divided into three divisions, junior, senior misses, and senior boys. The commercial department, conducted by Mr. John MacGregor, has been attended by upwards of 260 pupils, studying writing, arithmetic, book-keeping, and mathematics. The Latin class, conducted by Mr. John Miller, A.M., has been attended by 16 pupils; the French, conducted by Mons. Dutoit, by 14; the pianoforte, conducted by Mr. Banks and governess, by 37; needlework, conducted by the lady superintendent, Miss Johnston, by 34. Some of the pupils attended only one class, but more than three-fourths of the whole number were enrolled in two; many were pupils in three departments, and some in four. A majority of the pupils this session were girls. The tickets sold for evening classes amounted in all to 1,889. —On the motion of the Chairman, seconded by Mr. R. B. Smith, the report was adopted.—The prizes having been distributed, other gentlemen addressed the meeting.

GOLD MINING IN VICTORIA.

By Mr. Philip A. Eagle.

[*Continued from page* 462.]

Chap. II.

Average Earnings of Miners—Improved System of Working—Wet and Dry Leads—Poor Ground "Payable" to Work—Sluicing—Hydraulic Operations—Remarks.

Notwithstanding the marked decline in the produce of the gold fields, the amount of yield in proportion to the number of persons engaged in mining is little inferior to the experience of some half dozen years back; it follows, therefore, that the miner of the present day is better remunerated than his predecessor.*

How far this theory will hold good can only be determined by comparing the yields of the two periods with their respective populations.

The maximum of the mining population for 1863 is placed in round numbers at 93,000: 70,000 Europeans and 23,000 Chinese; but as all Chinese upon the gold fields are classed under the head of "miners," it will be necessary to strike off at least an eighth of this number as persons who are engaged in other pursuits, leaving the actual mining class at, say, 20,000. Rating their individual earnings at four pennyweights per week, or about £40 per year (which, I think, fully represents the fact), they will absorb about £800,000 of the annual produce, leaving £5,737,508 to the credit of the European side. Now, as a large quantity of gold is still taken away by private hand, converted into manufactures, and otherwise escapes the customs, amounting in all to, say, one-twentieth of that upon which the export duty is paid, the aggregate earnings of the European miners may reasonably be estimated at £6,024,383.

Of this class, returned as "mining population," it is calculated that fully five per cent. are non-producers, leaving the number of actual miners at 65,100, whose yearly earnings would amount to £92½, or better than 23 ounces of gold per man, equivalent to 34 ounces obtained in—taking the divisional year—1857.

An immense impetus has of late been given to mining enterprise, and to the development of the resources of the colony. The system of co-operation has proved eminently successful, and the amalgamation of small parties of working miners is steadily progressing on most of the principal fields.

More systematic, effective, and economical methods of working have replaced the former superficial and unskilful process; legislation has also made liberal concessions to the mining interest; permanent reservoirs have been constructed throughout the different districts, the imposts have been reduced, the mining laws amended, and the area of claims enlarged.

Some of the "amalgamated companies," which possess considerable capital, are occupied principally in working the "deep leads," which are most numerous on the Western and South Western fields, and though from the nature of these operations, considerable time and expense are involved, they have in most cases proved highly remunerative. At Ballarat alluvial mining is conducted profitably at a depth of over 500 feet* after penetrating probably 250 feet of basalt and 150 feet of the primitive rock.

Other companies embrace a wider range of operations. Large tracts of ground on abandoned diggings are leased, and the whole of the alluvial is cut through and rewashed. In some places the gold is found finely distributed over large areas; and ground which a few years back would have proved unprofitable to work, is now made to yield a remuneration varying from £3 to £15 per man per week, and even larger returns are obtained in localities possessing considerable water power available for puddling and sluicing operations.

In the Ovens district, in Gipp's Land, and on the Goulbourn and Loddon Rivers extensive washing operations are carried on.† In some instances the ground is washed from the surface to the bottom, a depth of perhaps thirty feet, and the economy of the method adopted is shown by the fact that earth containing but six or seven grains to the cubic yard will yield a remuneration of 10s. and 11s. per head per day.

To those unacquainted with the system of reducing large quantities of auriferous earth, the following illustration of the process in vogue at one of the creek diggings (Talbot) may prove interesting.

In this instance, however, the motive power is obtained from a reservoir constructed for the use of the miners, by private speculation, and which receives the drainage of one hundred miles of country. A feeding dam is excavated about a third of a mile from the principal scene of operations (Kangaroo Gully), which is supplied by a race cut from the reservoir. Another race is cut from the dam to the top of a hill, from whence the water is conducted along a flume to a height of about 30 feet above the workings. From the point of the flume, a pipe is carried perpendicularly to within a few feet of the ground, and from this pipe another pipe (this time made of canvass to secure flexibility) is laid down to within a few feet of the earth to be removed. Previously a large cutting, about 18 feet in width, was carried across the gully, and thus, having secured a good face in one direction, a "tail race," half a mile in length, was cut through the old ground on the opposite side, in order to secure the complete running

* The difference in the exchangeable value of the earnings of the miner of the respective periods named, would be about 50 per cent.

* There are 36 companies (alluvial) in Ballarat district, with shares amounting in all to £683,886, and which have laid out in machinery and buildings constituting the plant, but without calculating the expenditure for labour in the mines, £106,399. The plant of the Koh-i-noor Company cost £12,000, and their shares are worth £100,000, or £2,500 each; that of the Great Extended cost £9,000, and the shares are worth £144,000, or £1,800 each. The Albion shares are valued at £1,600 each, or £100,000 in all. The plant of the Royal Saxon Company also cost £12,000, and their shares are worth £32,000, or £800 each; and so on down to the little companies with shares of £5 and a proportionally small outlay in machinery. A recent "washing up" of a fortnight's labour at the works of the Great Extended Company yielded 2,166 ounces of gold, valued at £8,718 odd.

† There are altogether upwards of 360 steam engines (having a combined horse-power of 6,380) engaged in alluvial operations on the gold fields, besides 4,160 puddling machines, 500 whims and pulleys, 800 sluices and toms, 400 water-wheels, and 31 hydraulic hoses.

off of the water, and thus prevent an inundation of the works by a reflux of the element. At the end of the canvass hose, a nozzle, about three feet in length, is fixed for the water to pass through, and this nozzle is directed by one man against the earth to be removed. Some idea of the force with which the water strikes the earth, may be gathered from the statement that 700 gallons of water is delivered every minute, and that about the same time suffices to displace avalanches of gigantic size. The director of the nozzle first undermines a part of the face, perhaps fifteen feet in length. A short time suffices to create a gutter about a foot or eighteen inches wide, which is followed by the displacement of all the earth above, up to the surface, a distance of about twelve feet. This comes tumbling down in front of the operator, who, by spasmodic jerks of the nozzle, washes the lump into fine sand in the short space of a few minutes. The gold deposits itself on the bed rock, but the *débris* is carried off by the force of the water into sluice-boxes, which are laid down in the tail race. About 100 feet from the commencement of these boxes, two men are engaged in clearing away the stones and sand, thus preventing the boxes from being choked by the stuff which is continually being carried along them by the water. After washing 7,000 or 8,000 loads of dirt, at the rate of 1,000 loads per week (the working time being about 10 hours a day), the water is turned off, and the surface of the bed rock dug up for a few inches. The stuff is collected into a heap, and worked by the hydraulic process into the sluice boxes, the first of which, being perforated, catches all the gold. A few days are sufficient for the clearing-up part of the arrangements, when the water is again turned on and operations commence afresh.

Of the profits of this scheme, it may be stated that material that will average a quarter of a pennyweight to the load will pay handsomely.

As much as a thousand loads can be thus washed in a week by four or five men, but upon the completion of a plan for carrying off the tailings without the employment of manual labour, a much larger quantity of earth can be removed and washed by the same number. As it is, after paying for the water, Reid and Co.'s party netted over £3 per week, each man, at the first washing up a few months back.

The great value of some such scheme as the hydraulic process, when applied to operations on what are known as dry diggings, will be better understood from the statement that in the Maryborough district (and possibly in others) nearly the whole of the ground will pay to wash in this manner.*

The extent of ground that is supposed to be auriferous (exclusive of Gipp's Land) has been estimated at 20,000 square miles. The portions of this ground already mined upon, or so returned by the mining surveyors, cover a total area of less than 800 square miles, of which probably not more than 150 or 200 square miles have been actually wrought. Even but a small proportion of this can be considered as entirely exhausted. Recent explorations prove beyond a doubt that a rich gold field exists at Wood's Point and Jamison, on the Upper Goulbourn, far more extensive than any yet known, and daily discoveries are being made, which assure us that a very large portion of the Gipp's Land range of mountains is abundantly if not equally auriferous.

Looking at the renewed activity throughout the established mining districts, and the steady accession of fresh and valuable ground, there is good reason to believe that for many years to come gold will be the great staple of Victoria.

(*To be continued.*)

* The amount of labour expended on alluvial mining presents the most astonishing results. Whole hills, often of considerable dimensions, and covering perhaps several acres of ground, have been carted away and washed, and in other cases have been left supported on blocks of timber. The very features of the country are effaced, and what were once known as gullies, hills, and flats, covered with endless heaps of pipeclay, lose every trace of their original character under the successive manipulations of Europeans and Chinese.

Fine Arts.

Picture Sale in Paris.—An extraordinary sale took place in Paris on the 25th ult. It included only fifteen pictures, most of them being of very small dimensions, but the proceeds, which were realised in about forty minutes, reached no less a sum than 222,900 francs, or say £600 on an average for each work. The collection was the property of Prince Paul Demidoff, and included one work by Decamps, one by Delaroche, one by Dupré, one by Gérome, one by Marilhart, seven by Meissonnier, one by Th. Rousseau, one by Ary Scheffer, and one by Horace Vernet. The prices realised were as follows:—"A Woman in a Forest, and followed by a child, both carrying wood" (Decamps, 1850), about 20 inches by 17 inches, £400. "The Arrest of President Duranti" (Paul Delaroche), very little larger than the preceding, £752. "The Winnower" (Jules Dupré), £328. "A Turkish Butcher" (by Gérome), a small picture about 9 inches high and 10 inches wide, which attracted considerable attention at the Exhibition of 1862, £240. "Sunset on the banks of the Bosphorus" (a small picture by Marilhart), £206. The above lots created considerable interest, but the following works by Meissonnier caused a perfect furore amongst the amateurs present. "Une Lecture chez Diderot," one of the artist's best-known works, containing seven figures, and bearing date 1859, size 8 inches by 11 inches, £1,520. "The Interior of a Guard-house," soldiers grouped round a table and playing at cards, others talking around the fire, in all eleven figures, dated 1858, size the same as the preceding, £1,148. Another "Interior" of the same kind, two soldiers playing at cards and others watching the game, a composition of only six figures, and rather smaller in size, dated 1860, £1,200. "A Captain descending a Staircase," with his sword under his arm (1861), a single figure, size about 9 inches by 6 inches, £780. "Gentleman seated at a table covered with books, music, bottles, and glasses, and playing the Mandoline" (1859), same size as the preceding, £480. "A Tired Cavalier," sleeping on a bench in the full glare of the sun (1863), not larger than the palm of a man's hand, £200. "A Gentleman, wearing a red cloak, and resting against a column in the *grande salle* of a Palace," same date, and even smaller than the above, less than 5 inches by 4 inches, £246. Total proceeds of these seven pictures, £5,574. A landscape, "Evening after a Storm" (Th. Rousseau), a small picture, fetched £128; and "Léonore" (Ary Scheffer), £160. "The Fight between Brigands and the Pope's Guards," one of Horace Vernet's best and most popular pictures, painted at Rome in 1836, and engraved by Jazet, size about 34 inches by 52 inches, £1,160. This is altogether one of the most remarkable sales of the year.

Commerce.

Submarine Telegraphy.—Professor Samuel F. B. Morse has lately published the following letter:—"In a notice in the *Telegraphic Journal*, of April 2nd, of the late Mr. Brett's collection of pictures, there is this incidental remark; 'The late Mr. J. W. Brett, who was designated by Professor Morse as the father of submarine telegraphy,' &c. I have never designated Mr. Brett, nor any one else, as 'the father of submarine telegraphy,' having always claimed to have first proposed, and personally laid and operated, the first submarine telegraph myself. Mr. Brett I knew well; he was a personal and

highly esteemed friend, but I knew that he supposed himself to be the first who had proposed a submarine line in 1845. In conversations with him I always insisted that not only the first proposal, but the first actual execution and operation of such a line, belonged to me. I told him I had unanswerable evidence of the fact. This announcement to him I saw gave him uneasiness; and after I left Paris in 1858, for Porto Rico, he wrote me a letter, under date of Nov. 15, 1858, in which he asked me to give him the history of my connection with submarine telegraphy. To this letter I replied from Arroyo, Porto Rico, December 27, 1858, quite at length, giving him minutely its history. In that letter (a press copy of which I have by me), I showed him that at least as early as 1838 I had made the proposition of an Atlantic telegraph to Robert Walsh, Esq., the American consul in Paris, for Mr. Walsh testified to that fact of his own move, without my knowledge, at the time in one of the American journals, of which he was the foreign correspondent. But I refer him also to my letter of Sept. 27, 1837, to the Secretary of the Treasury, published in the Congressional documents, in which letter I suggest the submarine method of constructing a telegraph line. I referred him also to my letter to another Secretary in August, 1843, in which I make the distinct prediction of a future Atlantic telegraph, as a deduction from experiments I had made; for in the autumn of 1842 I had carried into effect the proposition of a submarine line in the harbour of New York, laying out the line personally from Castle Garden to Governor's Island. This was an acknowledged success by the journals of the day, and for this success I received the gold medal of the American Institute. This medal fixes a date (1845) unmistakably. Mr. Brett rests his claim on the fact that in 1846 he addressed a letter to the British Government proposing oceanic and subterranean telegraphs. The year 1845 is the earliest date to which he appeals, and at that date he had only suggested a plan of submarine telegraphs to the British Government, while three years before I had actually constructed and operated in New York harbour a submarine telegraph line. It is obvious, therefore, that I could not have designated Mr. Brett as the 'father of submarine telegraphy.' The *Telegraphic Journal* marks these words professedly as a quotation from a written or printed document of mine. I have never written nor printed any such admission. The nearest to such an admission is the following extract from the historical letter alluded to, which I wrote to Mr. Brett. After giving him a detailed account of the steps I had taken in submarine telegraphy, I say, 'I have read your account of the origin and progress of the ocean telegraph with deep interest, and if chronology by its rigid dates gives the origin of submarine telegraphy to me, it cannot detract from you the undoubted merit of having independently originated the project of submarine intercommunication, and successfully carried it out, too, in Europe to a useful result. I esteem and honour you as the *father of European submarine telegraphy*, and I rejoice that both the honour and the profits have been so justly awarded to you.' In thus awarding to Mr. Brett in that letter the honour of being an independent originator of 'European submarine telegraphy,' I ought to say that if there are other claimants to that position in Europe, I do not pretend to decide between them. I based my remark to Mr. Brett solely on his representations to me, believing him to be, as he was, an honourable and a high-minded, as he certainly was a generous and worthy man. If the supposed admission on my part that Mr. Brett was the 'father of submarine telegraphy,' is founded on this letter of mine to him, it is seen at once that it is a misquotation in the *Telegraphic Journal*, and (as I am willing to believe) through mistake, that the important qualifying word 'European' was left out, but which is necessary to be inserted to make the quotation conform both to my letter and to the truth of history."

Colonies.

Cultivation of Tobacco in Queensland.—The *Queensland Times*, of the 17th March, in referring to the cultivation of tobacco, says that it has lately been attracting considerable attention. "Mr. M. Murphy has now a crop on one acre of land near Booval, which is said by New South Wales growers to demonstrate that a first-class leaf and a good crop can be grown in this colony. Mr. Murphy intends to enter largely into tobacco manufacture, and has received a screw press from Sydney for the purpose. He confidently expects to turn out an article equal to American, in quality as well as appearance. The cigars made by him are pronounced by competent judges to be first class, but of course wanting in age. Mr. P. O'Sullivan will commence the manufacture of tobacco on a large scale within a day or two. He expects to be able to turn out two cwt. per week. The supply of the leaf in Queensland is not equal to his requirements, and he has ordered a large quantity of American from Messrs. Jones, of Liverpool. Mr. O'Sullivan states that the best sample of tobacco he has yet received has been from Mr. Stewart, of the Bald-hill. He has also obtained a good sample from Mr. M'Intosh, of Gladstone. A great number of farmers around Ipswich are growing small quantities of the weed, and, from the demand created by Mr. O'Sullivan, we have no doubt that a great breadth of land will be sown next season. Tobacco was grown in this colony twenty years ago, by Mr. Thorn, when he gathered three crops in one year, the second being actually superior to the first. We hope that the mistake will not be made that our New South Wales friends fell into, of growing coarse kinds, and working up rubbish with the prime leaf."

Floods in New South Wales.—Serious floods in the district of the Hunter River took place in February. Heavy rain set in on the 9th of that month, and continued for several days, the Hunter and its tributaries rising gradually until the 13th, when the waters reached their maximum height, which, at Maitland and Morpeth, appears to have been about two feet below the great flood of 1857. Owing to local causes the height of the water varied considerably in different localities. At the Paterson, the greatest height attained was about six feet below the great 1857 flood, while at certain places on the Lower Hunter it is stated, on good authority, that the present flood was the highest ever known. The upper parts and tributaries of the Hunter, and even on the western waters beyond the dividing range, seem to have suffered more severely than their neighbours in the lower locality. The loss of life is not yet accurately ascertained. The destruction of property has been very great. The lucerne, maize, and potato crops in the Maitland and Morpeth districts may be looked upon as wholly lost. The loss of the crops will fall with great severity on the farmers of the Lower Hunter, as the lucerne and maize are the main source of their livelihood. The lower part of the course of the Hunter is so exceedingly tortuous, and the fall so insignificant, that on the occurrence of heavy rains in the upper parts of the basin of that river, the waters cannot drain off nearly as fast as they descend; the consequence is that floods are frequent. The remedy for this is stated to be easy. The cutting of a new canal between Maitland and Morpeth, a distance of only about three miles, would probably be sufficient to prevent any serious damage from floods to all time coming.

Notes.

Agricultural Chemistry in France.—The present Minister of Public Instruction is evidently intent on carrying out the system in all its branches. It is very questionable whether it is wise, or otherwise, for the State to

supply technical education gratis to the people, and thereby induce immense numbers of young men to give up their time to the pursuit of studies for which very many have little natural talent, but only a desire, and who would, were they compelled to contribute towards the expense of such training, turn their attention to matters which would occupy less time, and place them in a more normal position, or, in other words, it is very doubtful if the charitable system, for such it is, is applicable to anything beyond elementary education; but, setting aside this question of principle, it must be admitted that the minister is doing all in his power to open wide the doors of literature, art, and science, to the youth of France. The newest exemplification of the activity which marks the reign of the minister in question, is the establishment of a laboratory of agricultural chemistry in the Museum of Natural History, at the Jardin des Plantes. This laboratory and the instruction in connection with it, are to be public and gratuitous. The direction is entrusted to M. Freury, who is to have the valuable aid of M. Chevreul, the celebrated chemist and member of the Institut of France. The courses of study will embrace the examination of water, oils, minerals of all kinds, manures; in fact, it will embrace everything connected with the scientific portion of agriculture. The list of pupils entered contains already a hundred and ten names, and, as these are all mentioned as having passed through the scientific courses of the College of France, it is to be presumed that some such initiation is expected of those who avail themselves of the new public laboratory. Of course, if such be the fact, the description of the establishment as public and gratuitous is rather a misnomer.

Dublin Exhibition of Irish Manufactures.—This Exhibition, originated by the Royal Dublin Society, was opened on Wednesday, the 25th May, by the Earl of Carlisle, Lord-Lieutenant of Ireland. The ceremony was attended by all the principal officers of state, and included the performance of an inauguration ode, written by Dr. J. Francis Waller, and composed by Dr. R. P. Stewart. In the course of an address presented to the Lord-Lieutenant, a visit from the Prince and Princess of Wales during the season was spoken of as probable.

Dublin International Exhibition of Arts and Manufactures, 1865.—The directors of the Dublin Exhibition Palace and Winter Garden Company have resolved to inaugurate their building, now approaching completion, by holding an International Exhibition of Arts and Manufactures in the year 1865; and, in carrying out this design, solicit the co-operation of artists, and manufacturers, and others, in the United Kingdom, the British colonies, and foreign countries. The exhibition will be opened on the 9th of May, 1865, and will remain open for a period of six months; and, at its close, arrangements will be entered into for keeping the buildings open as a permanent exhibition, on the plan of the Crystal Palace, Sydenham; and exhibitors who may desire to retain space will be allowed to do so on liberal terms. A special committee has been appointed to carry out the various details; and, as every means will be taken within the power of the directors to render the undertaking attractive and successful, it is trusted that all those interested in the various departments of Arts and Manufactures will aid the efforts of the committee by a timely and cordial co-operation. The Fine Arts Department will be placed in the main building, erected in brick and stone; the machinery in a separate court, and the general Exhibition will be held in the other portions of the buildings. No rent will be charged to exhibitors. The productions of all nations will be admitted. The general plan for the division of the Exhibition will be similar, as far as practicable, to that of the Exhibition of 1851, viz.: raw materials; machinery; textile fabrics; metallic, vitreous, and ceramic manufactures; miscellaneous manufactures; fine arts. Space will be reserved for showing illustrations of the following processes:—Steel-pen making; pin making; needle making; button making; medal striking; gold-chain making; engine-turning for watches; brick and drain-tile making; glove making; stocking weaving; the manufacture of linens; the manufacture of woollen fabrics; ribbon weaving; glass blowing on a small scale; type casting; type printing, by hand; lithographic printing; copper-plate printing; earthenware printing; porcelain printing; a potter's wheel; turning in metal, wood, and ivory; lace making of all kinds; book binding; tabinet and poplin weaving; straw-plait making; pipe and cigar making. The whole space for exhibition will cover about five acres.

Dangerous Percussion Caps.—Attention has recently been called to this subject in various quarters. It appears that cheap and badly-made caps are commonly sold, and are used, first, very largely by children in their toy guns and pistols; secondly, by others more advanced in years, who at fairs and other places of public resort shoot with them at a target; and thirdly, by poor men for sporting purposes, who are tempted to buy them on account of their cheapness. Unlike the best percussion caps, they are composed of a very brittle metal, which in the explosion of the detonating material within is apt to splinter, and the fragments fly off with the most dangerous rapidity. They may be purchased at the rate of 500 for 1s. Parents, in perfect innocence, buy them for their children, and but too often learn from sad experience the danger of the plaything they have given them. In the explosion of the cap a small piece of the metal flies off, and strikes the eye of the person shooting, or that of a bystander. A surgeon to a London hospital states that, of all the eyes he has seen thus irreparably destroyed, he has, on careful investigation, ascertained that the percussion caps used were cheap, and consequently bad.

Explosion in Mines.—M. Gairaud recently communicated to the French Academy of Sciences, a method for preventing the consequences of explosion by fire-damp, or at least for reducing them to mere pecuniary damage without loss of life. His plan is to produce explosions by means of the electric induction spark of Ruhmkorff's machine before the miners descend into the galleries. After describing the way in which the wires ought to be arranged, he says:—"Every day, before the miners go to their work, several sparks must be let off in the galleries; then if an explosion ensues the gas will be destroyed; if, on the contrary, after several sparks there is no explosion, there is no reason why there should be any with an ordinary lamp." It was stated that a similar practice had long been in use, though not with the electric spark, men being sent down into the galleries with lights fixed to long poles. They creep along holding the lights aloft, because fire-damp always accumulates at the roof of the gallery, and they thus produce explosions which are harmless in proportion to the frequency with which the operation is performed.

Correspondence.

Elementary Examinations and District Unions of Institutes.—Sir,—There is, perhaps, no portion of the work of Mechanics' Institutes of more practical value than the elementary examinations, under the system established by the Society of Arts. It is bringing the stimulus of competition for local prizes, and the incentive to industry from the public recognition of exertions for self-improvement, home to the humblest class of students, and thereby applying the spur to application at the time when it is most needed. It is also preparing the way for those more advanced studies for which the certificates of the Society of Arts have been the means of obtaining most substantial advantages, and it has also helped to relieve local committees from much trouble and difficulty by being made to serve for the preliminary examinations, which are indispensable to the successful working of the

Final Examinations. In order, however, that the system should accomplish all the good of which it is capable, it is almost indispensable that the several Institutes which exist over the country should be formed into district or county associations, such as those in Yorkshire, Lancashire and Cheshire, East Lancashire, Worcestershire, the Southern Counties, &c. There is no doubt that an Institute in Union with the Society of Arts may adopt the system, but the benefits would be confined to its own members, and the certificate would have little more than local value, because it would be awarded by the single Institute, whereas by a county organisation all the Institutes, large and small, might share in the advantages, and the central committee, as a representative body, would give to the certificates that character of impartiality which would be their great value. The competition for prizes would be more active from the greater number engaged, and the smaller Institutes would enjoy advantages from which, without a union, they are altogether debarred. I would suggest that the initiative should be taken by the Institute of every county town where no union now exists, and that a circular be sent to every Institute in the county or district, proposing the formation of a union, asking for co-operation, and suggesting a meeting of delegates in some central place to confer upon the terms, &c. The rules of existing Unions, which may be readily obtained, might form the basis of the proceedings, and influential gentlemen might in the meantime be canvassed for aid, whilst there is no doubt that accommodation might be found either in a corporation building or that of the central Institute. These are merely a few suggestions in the hope of making the work of institutes more really useful by association.—Barnett Blake.

The Patent Laws.—Sir,—Absence from London and other urgent engagements prevented me from attending the reading and subsequent discussion on Mr. Webster's paper in reference to the operation of the Patent Laws. I have read the report in the *Journal* with much interest, and think with the chairman that the subject had been fully discussed on the bearings of the case brought under notice; still there appears to me to be another view of the subject of great importance, and which, to my mind, is suggestive of a remedy for the evils that all parties allow to exist in the operation of the Patent Laws. How much the prospect of protective monopoly tends to develope invention must remain a debatable question, and that the inventor of a machine or process that gives increased power or facility to the producer of wealth is entitled to a reasonable reward for the benefits conferred, I think we are all agreed, and it appears to be a general opinion that the public are the best judges of the value of such reward. Neither is the question quite distinct from public interest, as some speakers appear to think, when they describe a patent invention as altogether a new and independent means of producing wealth, for suppose some inventor to produce a better covering for the feet than our present boots and shoes, and holding by the monopoly of his patent, to refuse to let other persons use his process, or, what is equivalent, to fix an unreasonable amount of royalty for its use, the whole trade of shoemakers, and the public also, would be injured by such a patent. I do not pretend to know or even to understand the slippery scale by which imitations, past, present, or to come, are made legally to slide into or through specifications of patents. All my knowledge upon the subject has been acquired by long practice and intimate connection with the working out of patents, and I have had much to do with patents, and many opportunities of watching the progress of them, and the result of that experience is—that patentees may be divided into two classes. First, the scientific investigator, whose constant study is to apply the powers of science to the every-day business of life, and this class I have always observed to pursue their studies, not with a view to pecuniary reward, but too frequently at a very great sacrifice, for which they should be repaid and well rewarded by the public who gain by such inventions The second class of inventors, which, I think, is by far the most numerous, are those who hope to find in their next new patent the "welcome nugget," and they strive to discover some new way of doing a thing differing from that in general use, calling it an invention, and the patent law recognises it as such, and they too often make great sacrifices to accomplish their object, and not unfrequently sacrifice the public by means of their inventions. A few years since I knew a man who had secured several new patents, who in a short time realised a considerable sum by the sale of them, and boasted that he not only possessed the scientific knowledge that enabled him to discover improved mechanical aids, but also the acumen to apply them with advantage. But the source of his success too soon became evident in the wail of the widow and the lamentations of his dupes, whom he had led into great loss by the ignis-fatuus light of his legally registered patents. To secure to the first class of patentees the due reward for their study and research, and to protect the public from the impositions of the second class, it has been suggested to submit the whole to the veto of a body of experts; but still the general opinion appears to be that the public are the best judges, and so I think, and therefore would suggest that every inventor should be rewarded fairly for the benefits he confers upon the public; but, at the same time, I do not think that the public should be shut out from all participation in such benefits. I would, therefore, propose that all persons who felt that they could apply the principle of any patent to practice should be at liberty to do so by paying a small royalty for the use of it, and this, from my own experience, I do not think should exceed 4 per cent. upon the amount of goods manufactured. I would, therefore, place all patents in the hands of commissioners, who should fix the rate of, and grant licenses to, any persons requiring them, paying the amounts over to the patentees from time to time. This arrangement would at once show the value of the patent by the extent of its use; and the patentees of useful inventions would thus obtain their reward, while in proportion as the utility decreased so would the reward, and persons disposed to purchase patents would thereby ascertain their intrinsic value, and thus the patentee would be protected in his rights, and the public in the use of and from the abuse of patents; and the patentee would have every possible inducement to make his specification clear and intelligible. I also think the working of such a system would induce the enactment of international patent laws, and if worked upon the same principle, it would soon be found that a patent in any one country would be equal to a patent in each, the commissioners in each country collecting the royalties and exchanging the profits with all the rest, while the expenses might be collected by a per-centage upon the profits, or, as at present, by fees. I think the latter plan the best, as then the losses resulting from the bad and speculative patents could not operate as a tax upon the good and profitable ones, and I would suggest that a periodical statement of all royalties paid should be published. This is but the rough outline of a plan which has for many years occupied my attention.—Yours, &c., E. Nash.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Entomological, 7.
Asiatic, 3.
R. United Service Inst., 8½. Mr. George Cheek, "Sub-marine Ships as a Mode of Attack."
Royal Inst., 2. General Monthly Meeting.

Tues. ...Photographic, 8.
Ethnological, 8. 1. Mr. Dunn, "On the Influence of Civilisation upon the Development of the Brain in the different Races of Man." 2. Mr. Crawfurd, "On the Source of the Supply of Tin for Bronze Tools and Weapons of Antiquity."
Royal Inst., 3. Professor Marshall, "On Animal Life."

Wed. ...Geological, 8. 1. Mr. W. Boyd Dawkins, "On the Rhætic Beds and White Lias of West and Central Somerset, and on the Discovery of a new Fossil Mammal in the Grey

Marlstones beneath the Bone-bed." 2. Dr. H. B. Holl, "On the Geological Structure of the Malvern Hills, &c." 3. Prof. R. Harkness, "On the Reptiliferous Rocks and Footprint-bearing Strata of the N.E. of Scotland." 4. Mr. James Powrie, "On the Fossiliferous Rocks of Forfarshire and their contents."
Microscopical, 8.
Literary Fund, 3.
R. Society of Literature, 8½.
Archæological Assoc., 8½. 1. Mr. Roberts, "On the Discovery of Mediæval Remains upon pulling down some Modern Work at the Guildhall, London." 2. Mr. Hopper, "On the Clocks and Watches belonging to Queen Elizabeth." 3. Mr. Cuming, "On Ancient Flower Vessels."

THUR. ...Royal, 8½.
Antiquaries, 8.
Royal Inst., 3. Mr. John Hullah, "On the Third Period of Musical History (1600-1750)."

FRI.......Astronomical, 8.
Royal Inst., 8. Professor Tyndall, "A Magnetical Experiment."

SAT......Royal Inst., 3. Mr. Alex. Herschel, "On Falling Stars and Meteorites."

PARLIAMENTARY REPORTS.

Par. Numb.

Delivered on 12th May, 1864.

93. Bills—Gaols.
97. ,, Indemnity.
North America (No. 13)—Correspondence respecting the Removal of British Consuls from the so-styled Confederate States.
North America (No. 14)—Correspondence with Mr. Mason.

Delivered on 14th, 18th, and 19th May, 1864.

116 (1). Union Assessment Committee Act—Return.
182. Lisburn Election Petition—Minutes of Evidence.
283. Criminal Offenders (Scotland)—Abstract of Tables.
231. Sugar, &c.—Return.
281. China and Hong Kong—Return.
294. Navy—Supplementary Estimate.
203. Registration of County Voters—Report, Evidence, &c.
237. Galway (Western Districts)—Report.
243. Malta—Petition.
260. Poor Law (Workhouse Dietaries)—Dietaries, &c.
285. National Education (Ireland)—Regulations.
293. Education—Supplementary Rules, &c.
296. Revenue (Ireland)—Returns.
286. Tobacco—Return.
103. Bills—Chain Cables and Anchors (Amended, and on First and Second Re-commitments).
105. ,, Army Prize (Shares of Deceased).
107. ,, Vacating of Seats (House of Commons).
108. ,, Servants' Hiring (Scotland).
109. ,, Beerhouses (Ireland).
96. ,, Collection of Taxes (Amended).
101. ,, Public Works (Ireland).
Army Prize—Report of Commissioners.
Education—Recent Correspondence.

Delivered on May 20, 1864.

159. Labrador Customs Duties—Papers and Correspondence.
288. Oxford University—Statute.
291. Courts of Common Law and Chancery Commission—Return.
297. Treasure Trove—Return.
298. Exports and Imports—Return.

Delivered on May 21, and 23, 1864.

262. Iron-plated Ships and Batteries—Return.
270. Dockyards—First Report, Evidence, &c.
301. Navy (Vessels not Armour-plated)—Return.

Patents.

From Commissioners of Patents Journal, May 27th.

Grants of Provisional Protection.

Artificial stone, new composition for—1124—J. Potter.
Asparagus, &c., instrument for laying hold of—1253—R. Rimmer.
Bindings for pulley blocks—1132—J. Gardner and others.
Blotting paper—1192—J. Brown and A. P. Price.
Bobbins, &c., winding thread on—1150—C. P. Stewart & J. Gresham.
Boot and knife cleaning machine—1011—T. Pepper.
Bricks, apparatus for making—1170—J. Chambers.
Bricks, machinery for making—1247—P. Bawden and others.
Bricks, tiles, &c., kilns for burning—1196—T. M. Gisborne.
Brushes—1186—F. Coney.
Brushes, manufacture of—1180—T. W. and R. Condron and another.
Buttons—1251—T. Dean.
Canvas, tarpaulings, &c., treatment of—1203—W. Horne.
Carriages—1239—T. Wilson.
Carriages, construction of—1197—C. Martin.
Cocks, taps, and valves—1184—J. Rowland.
Dyeing—1243—R. A. Brooman.
Engines, rotary—1227—W. E. Newton.
Expressing liquids, &c., from substances—1024—G. J. Worssam.
Fibrous substances, machinery for combing—969—R. Midgley.
Fluids, heating and evaporating of—1178—A. V. Newton.
Fringes, manufacture of—1225—P. Craven.
Gasaliers, &c.—1162—J. R. Abbott.
Gasaliers, &c.—1201—T. Parker.
Gas and water mains, boring and tapping—1164—A. Upward.
Gas, apparatus for carburetting—1166—H. Woodward.
Gas, economising the consumption of—1156—J. H. Johnson.
Gas, &c., shades for—1168—W. E. Gedge.
Heat, apparatus for generating—1138—A. V. Newton.
Hooped skirts—1171—J. Whitehead, sen., and others.
Indicators—1217—M. Henry.
Ironstone, &c., extracting the oils and gases from—1172—H. Aitken.
Lace, manufacture of—1176—G. Pulsford and G. Walkland.
Laces and fabrics, manufacture of—1140—W. Simpson.
Land, cultivation of—1235—L. L. Sovereign.
Lead, extracting silver from—1174—Don F. M. M. del Real.
Liquids, taps for measuring—914—J. Lillie.
Liquors, storing and preservation of—1188—D. Jones and B. I'A. Bromwich.
Looms—1209—J. Dodgeon, J. Gaukroger, and W. Shackleton.
Looms, rotary shuttle boxes of—1146—G. Hodgson and A. H. Martin.
Lubricating compounds—1113—P. Ward.
Manna-sugar, purple dyestuffs from—1181—J. A. Wanklyn.
Minerals, machinery for hewing—1050—J. Russell, jun.
Motive power—972—J. H. Johnson.
Mouldings, &c.—1241—P. G. Etesse.
Mules for spinning—1233—W. E. Newton.
Plates, dishes, &c., means of heating—1219—R. H. Hughes.
Plates, &c., moulding and shaping—1249—H. A. C. Boulenger.
Printing—1237—A. Mackie and J. Salmon.
Quilted crinoline skirtings—1231—J. Brady.
Railway vans, &c., fire-proof—1221—D. West.
Scarfs, construction of—1152—A. Swonnell.
Sewing machines, embroidery with—1134—T. Evans.
Ship lamps, &c.—1158—J. Wavish.
Ships—1255—P. St. G. Græme.
Spinning and doubling, machines for—1144—W. Robertson.
Spool tubes, paper or linen—1148—W. Hirst.
Steam engines—247—W. E. Maude.
Steam engines and pumps—1142—J. J. Miller, jun.
Steam hammers, &c.—1190—J. Yule.
Stockings and socks—1207—H. A. Bonneville.
Street lamps, &c.—1259—J. Browning.
Sugar boiling—1136—E. Beanes and C. W. Finzel.
Syrups, manufacture of—1092—F. Leisz.
Teeth, drilling, &c.—1017—G. F. Harrington.
Vegetable fibres, machinery for treating—1245—W. Rowan.
Wet gas meters—1211—E. Myers and T. G. Progers.

Patents Sealed.

2990. E. Beavan and W. S. Weare.
2996. G. A. Thompson, sen., G. A. Thompson, jun., and J. Latham.
3000. E. W. James
3001. J. Fernie and G. Taylor.
3005. E. M. Boxer.
3010. G. J. Doddrell.
3012. J. G. Redman & G. Martin.
3014. R. Turnbull.
3018. J. Thom.
3021. G. Macfarlane.
3023. W. Wilson.
3024. T. Snook.
3028. T. T. England.
3031. J. Harper.
3035. H. D. P. Cunningham.
3037. R. A. Brooman.
3046. J. Robbins.
3096. M. Henry.
3111. H. Turner.
3139. B. Dobson, J. Hodgkinson, D. Greenhalgh, and F. Hamilton.
3142. J. H. Johnson.
3158. B. Fothergill.
3166. J. Davidson.
3263. H. P. Forrest.
789. H. A. Bonneville.
900. E. Dronke.

From Commissioners of Patents Journal, May 31st.

Patents Sealed.

3025. J. Dales.
3030. S. Trotman.
3036. C. Lungley.
3040. T. Knowles.
3042. D. Hulett.
3051. R. A. Brooman.
3056. J. Conlong.
3057. W. Gorman and J. Paton.
3073. G. R. Tilling and J. Park.
3094. P. R. Wason.
3200. J. Macarthy.
3210. F. Walton.
3232. J. Shanks.
3258. A. Noble.
181. J. H. Johnson.
620. F. Foster.
653. E. Baller.
663. H. Caudwell.
753. W. A. Torrey.
817. J. J. Lundy and R. Irvine.

Patents on which the Stamp Duty of £50 has been Paid.

1323. W. Roberts.
1378. F. N. Gisborne.
1411. E. C. Stanford.
1379. R. C. Ransome.
1461. J. Howard and E. T. Bousfield.
1565. W. E. Newton.
1325. E. Green and J. Cadbury.
1329. C. S. Duncan.
1356. W. Bywater.
1358. W. Hunter.
1371. T. Coradine.
1352. J. Ronald.
1353. A. Blake.
1372. R. Wilson.

Patents on which the Stamp Duty of £100 has been paid.

1508. E. P. Griffiths.
1635. W. E. Newton.
1665. A. V. Newton.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, JUNE 10, 1864. [No. 603. VOL. XII.

Announcements by the Council.

PRESENTATION OF MEDALS AND PRIZES.

His Royal Highness the Prince of Wales, K.G., President of the Society, has been pleased to appoint Friday, the 24th of June, at three o'clock, to present the medals and prizes awarded during the present Session. The Presentation will take place at Willis's Rooms, King-street, St. James's. Members will be admitted by ticket only, for which application should be made to the Secretary; each ticket to admit the member and one lady. The tickets are now ready for delivery.

CONVERSAZIONE.

The Council have arranged for a Conversazione at the South Kensington Museum on Thursday evening next, the 16th June, cards for which have been issued.

NOTICE TO INSTITUTIONS AND LOCAL BOARDS.

The Thirteenth Annual Conference between the Council and the Representatives of the Institutions in Union and Local Boards, will be held on Thursday, the 16th June, at Twelve o'clock, noon. WILLIAM HAWES, Esq., Chairman of the Council, will preside.

Secretaries of Institutions and Local Boards are requested to forward immediately the names of the representatives appointed to attend the Conference.

The subjects suggested for discussion have already been published in the *Journal*, and sent to each Institution.

Notice of any other subjects which representatives may desire to bring forward for discussion should be given to the Secretary of the Society of Arts.

The Secretary of each Institution is requested to forward, by book-post, a copy of the Annual Report of his Institution.

Representatives of Institutions and Local Boards attending the Conference are invited to the Society's Conversazione, at the South Kensington Museum, on the evening of the same day (16th June), and will receive cards on application at the Society's House, on the day of the Conference.

The Secretary is authorised by Mr. Twining to say that in case the Committees of any Institutions should be desirous to form a collection of objects illustrative of any or all the branches of Domestic and Sanitary Economy, in accordance with the principles adopted in the Twickenham Economic Museum, he would be happy, not only to supply every information bearing on this subject, but to subscribe £10—in the form of special museum furniture—to each of the first ten collections. It would be desirable for any Institutions entertaining this idea to instruct their representatives to make arrangements to visit Mr. Twining's Museum when they are in London for the Conference. A brief account of the Museum has been forwarded to each Institution. Communications on this subject should be addressed to the Secretary of the Society of Arts.

INSTITUTIONS.

The following Institutions have been received into Union since the last announcement:—

Abersychan (near Pontypool) Literary and Scientific Institution.

Laurencetown (Ireland) Young Men's Mutual Improvement Society.

Proceedings of the Society.

CONFERENCE ON THE DWELLINGS OF THE LABOURING CLASSES.

(*Continued from page* 488.)

The Conference on this subject was resumed on Friday morning, the 27th inst., at half-past 11 o'clock. William Hawes, Esq., Chairman of the Council, in the chair.

The CHAIRMAN said that to-day the business before them was the consideration of the fifth head under which the subject to be submitted to the conference had been divided, viz., "Remedies, A. What can be done by legislation? B. What can be done without legislation? and What assistance, if any, can the Society give in either of these directions?" It would be in the recollection of many present that in putting the last resolution on the previous day he carefully avoided giving his individual assent to the proposition which it contained, although that resolution undoubtedly embodied the general opinion of

the meeting, and he added that he hoped to have an opportunity, when the subject of the remedies was brought before the conference this day, to explain why he disagreed with that resolution, and in what manner he thought it possible to obtain for capital invested in buildings for the industrious classes a return, not only sufficient to induce philanthropists to embark capital in this work, but also to induce builders, on general principles of commercial enterprise, to find capital sufficient to supply the demands of the working classes. He thought, in conducting the business of the day, it would be desirable to discuss together the heads A and B, viz., What can be done with legislation; and, What can be done without legislation? In order to arrive at clear views upon these questions they must first thoroughly understand what they intended to do. They must understand for whose benefit they were suggesting remedial measures, and they must also clearly define how those measures could be carried into effect. Their object was not to suggest measures exclusively for the benefit of the industrious classes, not measures simply to improve their condition in all parts of the country—not merely to make them more happy, more religious, and more moral—but their duty was to suggest measures which should benefit the nation at large, for it was impossible that the dwellings of the working classes could remain in the unsatisfactory condition they now were in without seriously injuring the national character; and it was indispensable that all those who took enlarged views of the interests of the people, should look upon this subject as a national question of vital importance, and not as one specially affecting the class to which it more particularly referred. They proposed to benefit the working classes by increasing their home comforts, and thereby lessening the attraction of the club or public-house; by making their labour more efficient, by bringing their residences near their work, and thereby enabling them to earn more wages; by elevating their moral and social position, and by lessening, through the influence of such means, their temptations and inducements to immorality and crime. By providing them with better houses the nation would benefit by the existence of a higher standard of health among the people which would result from it—by the labouring population being more contented with their lot—by the decrease of drunkenness, and, therefore, of poverty, disease, and crime, whereby the expenditure required for the relief of the poor would be reduced. The question then arose how they were to get these better dwellings, and how they were to promote, not only their erection, but their subsequent maintenance, by the class for whom they were to be provided. At present, the opinion strongly prevailed that the wages earned by the great mass of the people were not sufficient to allow them to pay the rent of proper and decent dwellings; and, on the other hand, it was an opinion as generally received—and certainly the plans now hanging round the room appeared to confirm such an opinion—that good houses could not be so reduced in cost as to bring the rent within the means of the working classes. We had then to enquire how far these opinions were correct. The rent of a house was made up of the cost of the land, of the cost of the materials and of the labour employed in using them, and of the burthens imposed on the house when built. No one present, he was sure, believed that the legislature or private individuals could raise the rates of wages. It was equally absurd to attempt unnaturally to lower rents. They could not artifically alter the value of land, or the value of the materials with which a house was built. They could not affect the value of labour, by which those materials were put together; and there were but the other items to which he had referred, and which formed part of the sum charged as rent, within the sphere of legislation, and the consideration of which very properly belonged to the business of this meeting. The only elements of cost which were available to them were those charges on houses which were unforeseen by the legislature—viz., the house tax, the poor and local rates, and other local burdens which were attached to property of all kinds, especially to houses; and there were a great many laws injuriously and exclusively affecting this description of property, and the tenure under which it was held, which indirectly raised rents. The Society of Arts could no doubt beneficially exercise the influence it possessed in promoting measures which would relieve certain classes in town and country either wholly or partially from local rates and taxes and other fiscal burthens, and from the expenses attending the transfer of small plots of land. But this part of the subject had been considered the previous day, and resolutions had been passed declaring that in the opinion of the meeting great good would result from a careful re-adjustment of the incidence of taxation as it affected the dwellings of the labouring classes. But then the question arose, would this relief be sufficient to bring proper dwellings within the reach of the working classes, or, in other words, would it attract sufficient capital to this kind of investment to accomplish the object in view? He (the chairman) did not think it would; but, before suggesting any other plan by which capital might be provided, he would consider for a moment what had already been done, and what means were now in operation. Twenty-five or thirty years ago, associations for promoting the erection of small houses took the form of building societies, but, from information contained in letters he had received from gentlemen residing in the counties of Lancashire and Yorkshire, where these societies were now existing in the greatest number, it would appear—and the information agreed with his own experience—that whilst building societies did find capital for building purposes to a certain extent, the houses, when built, did not come into the possession of those for whom they were intended; they fell, for the most part, into the hands of small speculative builders. He, therefore, did not think building societies had done much towards the end they had in view, for, had they been as successful as they promised to be, some great result would have been accomplished by this time. Then there was another class of association—that of philanthropic individuals who desired the improvement of the labouring classes. The printed returns issued by Mr. Twining, and the facts given on the previous day by Dr. Greenhill, showed that the results of such associations were not such as would induce persons to invest money in them as commercial speculations. If they looked at the returns collected by Mr. Twining, they would see that the profits were so small that no one would advance money for those purposes except from philanthropic motives, and not with a view to pecuniary advantage. He objected entirely to this being treated exclusively as a philanthropic question. They must treat it as a commercial question, for unless they did so they would never touch the real grievance. They had then satisfied themselves that the present modes of meeting the difficulty had not been successful, and he feared that the relief from fiscal burdens would not so far turn the scale as to ensure a sufficient supply of proper dwellings. The question then arose, "Could the government, by any other means, stimulate the production of such dwellings?" In what he was about to suggest, he was aware he would be met by the political economist, who would say that government had no right to interfere as regarded dwellings, any more than with any other matter of trade or commerce, with the laws of supply and demand, and that assistance to ensure a sufficient supply of dwellings for the labouring classes ought not to be looked for from that source; but there were many instances in which, for the good of the nation, government did interfere, both with labour and capital, and therefore he had only to show that the interference he now advocated was consistent with principles generally acknowledged, and of sufficient magnitude to justify interference in this direction. Parliament legislated for the regulation of labour in factories and mines, also for carrying the working classes on railways at less than the regular fares, and in the construction of houses generally.

It advanced large sums for school buildings, and to encourage education. Government, at present, spent large funds annually in the maintenance of prisons, lunatic asylums, and other establishments rendered necessary by the vice and crime so often engendered in the present bad buildings in which the working classes were condemned to live. It confined and held in custody thousands who would have earned an honest livelihood had they been brought up from infancy in proper dwellings. There was, then, no force in the abstract objection to government interference, if it could be shown that the object was a national one. Then came the question—could the government, consistently with its ordinary practice, promote the erection of such buildings? he submitted that they could, and without new legislation, materially aid in promoting the object in view. At present money was advanced on loan, through the Public Works Commissioners, at a low rate of interest, to landed proprietors for drainage and other improvements; and public works of various kinds might be assisted on the same terms, proper security being taken for the repayment of the loans. Now, suppose that by such assistance a portion of the capital requisite for this special class of buildings could be obtained at such a low rate of interest as would just turn the scale and make their erection a good commercial speculation—could anyone doubt that there would be plenty of builders ready to provide ample and proper accommodation for the working, as they now did for the upper, classes? Supposing, for instance, such a block of buildings as that represented by the model on the table cost £100,000, and that an income of 8 per cent. could be obtained from it, it was clear that if one half of that sum, or £50,000, could be borrowed from the Government, at 3½ per cent., the interest on the other half would be raised to such a figure as would induce builders to supply the rest and enter upon such speculations. If the moiety of the £100,000 was repayable by a sinking fund in 30 years, the other half would still bear a high rate of interest, and by such legitimate means commercial speculation would be excited in this direction. He was quite at a loss to conceive how any objections could apply to such a plan as this. What was its object? Not only to benefit in a high degree one class of the community, but also to benefit equally the whole nation. They simply borrowed from the national fund to increase the national resources. If, by lessening sickness and improving the condition of the labouring classes, they thereby increased the number of days available to each man for profitable employment, they added materially to the national wealth, which would amount to many percentages upon the value of the loans, and make it nationally a very advantageous employment of capital. That was the ground on which he thought they could obtain, by existing legislation, ample funds to be invested in buildings for the working classes, and he believed it to be the only way by which they could secure the erection of a sufficient number of houses in large towns. In the country, though the number required was greater, they would be more dispersed and the houses of a smaller class. The landlord could, however, give as ample security for the repayment of the money borrowed as he now gave for drainage works; and if the houses were built on certain fixed principles and under certain well-defined regulations, ample security could be given for the money advanced. In conclusion, then, he would say in reply to the question—What could be done by legislation? that relief for fiscal burthens on this kind of property could be afforded, and could be justified in the interests of the State; and, secondly, as to What could be done without legislation? that there was authority under existing acts by which money could be lent for the purpose of building dwellings for the industrious classes, which, if brought into operation, might fairly be expected to yield most beneficial results. We should not let it be said we lent money to the landlord to improve his property, and refused to lend money to find a decent house for the workman. He therefore hoped, in considering this question, they would not treat it as one for the benefit of the working classes alone, but that they would regard it from a broader point of view, as a measure of most pressing urgency, and calculated to confer most important benefits on the whole nation. It would then be seen that it was the duty and interest of the country to stimulate the production of proper dwellings for the people; and he trusted that the result of this conference would be to place this question before the public and the government in such a light that measures would be taken which would induce capitalists to invest their property freely in the erection of the required dwellings, in full confidence that it would be a good commercial speculation.

Mr. G. M. Murphy remarked that the system suggested by the chairman was already carried out to a certain extent. He had been informed that a block of buildings had been erected at Cirencester, with money borrowed for a long period at a low rate of interest, as he understood, from government.

Dr. Hancock (of Dublin) called attention to the differences in the legislation on this subject in England, Scotland, and Ireland. Scotland was in this respect in advance of the other portions of the United Kingdom. Under the Montgomery Act, (10th Geo. III., cap. 31), leasing power was given for 99 years' over lands in settlement. The principle of that Act was extended to Ireland in 1860, at the time when the Tenure and Land Improvement Act was passed. He suggested, as the first step, that this leasing power should be extended to England. The next question was—What should be done with regard to landlords' improvements? In Scotland the Act he had referred to enabled persons with limited interests to lay out money in improvements. Scottish lawyers argued that building labourers' cottages was an improvement, and it was so accepted, but certain restrictions were placed upon it. In the case of cottages, in Ireland as well as in Scotland, it was dependent upon the opinion of the County Court judges or the Estates Court whether the cottages were to be considered beneficial or not. The chairman had with some diffidence proposed for England that which had been adopted in Scotland for upwards of a century, and in Ireland since 1860, that the power of lending public money for drainage should be extended to the building and improvement of labourers' cottages. That Act, however, as regarded Ireland, was terminable in ten years, therefore, he thought it was a safe proposition that what Parliament thought good for Ireland was good for England, and that was the step they should press upon the legislature to take. The next question that arose was—Why had not those powers in Scotland and Ireland been more extensively exercised? He thought the reason the owners of entailed estates had not done more was indicated in one of the resolutions passed on the previous day—viz., that the Law of Settlement stood in the way. The effect of the law of settlement was that it attached the liability to the wrong place—viz., where a person was born. That, in itself, was destructive to the increase of labourers' habitations. It was a fundamental mistake of the law of settlement, as pointed out by Adam Smith 80 years ago. They had a Poor Law in Ireland in which there was no law of settlement. Why should not that principle be applied to England? At the present time the population of the United Kingdom was extremely migratory; and Adam Smith asserted that what condemned the law of settlement was the migratory habits of the working classes. He would venture to suggest one other course which the legislature might take. The Chairman had pointed out that legislation had been directed to the limitation of the hours of factory labour, &c., and last session an Act had been passed to prevent journeymen bakers from sleeping on the premises, with other regulations as to bakehouses. He knew that the feeling of the working classes was strong against the plan of the workmen living on their master's premises, and it was a great question whether any except apprentices should be allowed to do this. It was well

known that the bothy system in Scotland worked very badly, and he thought some legislation in this direction would be desirable. He thought one of the most important questions was that of Building and Freehold Land Societies. At the meeting of the British Association at Newcastle, a gentleman from Coventry stated that the people in his locality were very dissatisfied in respect of the building plots they had obtained through these societies, that they found them most unmarketable commodities, and all the evils connected with the transfer of real property were concentrated upon those small properties, which for the most part were not adapted for labourers' cottages; and he thought that here also the legislature might interfere with advantage. In the case of railway and other joint-stock shares the means of transfer were most simple and were divested of all legal technicalities. There was no reason why facilities should not be given for plots of land being set apart for labourers' cottages, disposable in shares to be registered in some public office, and converted into a personal property, divested of all trusts, mortgages, settlements, claims, and entails, and transferable in the same way as railway shares. Such a process was rendered the more easy by the Lord Chancellor's Registration of Titles Act. He thought some such provision as he had suggested would meet a large portion of the difficulties.

Mr. Thomas Hare rose for the purpose of explaining the provisions of the bill to which he had alluded on the preceding day. It was "An act for amending the law of tenure and conveyance of certain real property within the limits of the metropolis, and for facilitating the acquisition and transfer of certain lands, tenements, and real estate therein, and especially of dwellings and interests of smaller value, and for extending the benefits of the law hereafter to other parts of the United Kingdom." Having read the preamble, which set forth the want of better facilities for the sale and transfer of small properties, he stated that the first provision related to Lord Westbury's Registration of Titles Act. Under that act an indefeasible title was conferred. When this was done with a plot of land, this bill would enable portions of buildings erected upon it to be transferred by simple registration in a local registry, or at the central office of the estate. The second provision of the bill related to power to convey lands for these purposes belonging to lunatics or other incapacitated persons. The next portion of the bill arose out of some late experience of his own. He believed one-third or one-fourth of the sites in the most densely-populated districts of London belonged to charity estates, more or less for the benefit of the poor. It was thought desirable to bring such estates within the operation of this bill, enabling the trustees of different estates to act together, by which it was believed their value might be increased immensely. The fourth provision of the bill affected the powers of railway companies, who would be often required in their operations in the metropolis to take more land than they wanted; and it was proposed to enable associations to purchase the surplus land of railway companies for building sites, in order to replace the buildings which had been removed. He was persuaded they could get, on the margins of railways, with the aid of the other provisions of the bill, considerable sites, on which extremely valuable buildings might be erected. The fifth portion of the bill was with reference to the buildings when erected. In carrying out the system of building in blocks, with shops below, and the upper stories held by different proprietors, difficulties had arisen between the parties, and it was proposed that each block should have its own committee of proprietors with their own bye laws to be administered by themselves. This was the case with regard to chambers in Lincoln's Inn. Two or three years ago a private act was passed, by which the rights of the several floors were regulated. The same principle, it was thought, would be very valuable as applied to such blocks of buildings as he was referring to. The next provision was for the regulation of local taxes, &c. It had been mentioned that unless the building contained outside staircases it was assessed to the house tax. Such fiscal laws as this were utterly intolerable. The rating should be according to the value of the individual tenements, whether the staircases were external or internal. No opposition could be given by the legislature to such a proposition as that. In the next clause it was proposed that when a site of this kind had been chosen, they should ascertain, with some degree of particularity, what the public charges on the buildings would be, before the improvements were made, and that for twenty-one years after completion the building should not be subject to a higher charge than it was before. The last clause provided that, on application to the town council of a borough, or the guardians of a parish or union, power should be given to extend the provisions of the bill to any particular town or district. He thought this measure of legislation would effect pretty nearly all they desired, inasmuch as it would bring in the whole great wages fund of the country for the purpose of providing that of which the people stood most in need. By these means the best classes of the working community would become the owners of their dwellings. The chairman had suggested loans by the government for these purposes; and he would add clauses to the proposed bill to that effect. Such assistance might be given directly to the working classes. By the repayment of 3s. per week—half the present rent of inferior accommodation—in 15 years a man could redeem a mortgage of £100, and pay 6 per cent. upon the money borrowed. What could be more profitable than that, both for the State and the people? And what better security could be afforded for the repayment of the money? Under such a system they would find multitudes of those who now became deteriorated in mind and body in the miserable abodes they were compelled to hire, eager to become purchasers of their dwellings, and their whole moral tone and standard of well-being would be raised.

Rev. A. W. Thorold said he felt thankful for two statements in the chairman's address, which seemed to him to involve principles of the greatest importance. One was, that they must not confuse together philanthropy and commerce. The work of philanthropy had been carried out in these different associations of which they had heard so much—those were the efforts and experiments of philanthropy—not wasting money, but spending it most economically; therefore he thought the right way of looking at them was as philanthropic experiments rather than as commercial enterprises. He was, however, satisfied this object could only be successfully accomplished on a commercial basis. With respect to legislation, the Chairman had laid down another proposition, equally true—that no Act of Parliament would affect either the value of land or the value of labour and materials for building. All they wanted from the legislature was to assist them as far as possible in removing the obstacles which were admitted on all hands to stand in the way of this movement. He had no doubt an Act, such as Mr. Hare had sketched, would make land more available for these objects. That gentleman was no doubt aware of Lord Shaftesbury's Act of 1851, which was analogous to the Baths and Washhouses Act, in which power was given to municipal bodies and vestries of parishes to borrow money on the security of the rates, to be repaid by half-yearly instalments, spread over a number of years. He was not aware of a single instance in which that Act had been put in force.

Mr. E. Akroyd said that it had been so to a limited extent in Halifax, with reference to a model lodging house for travellers passing through the town.

Rev. A. W. Thorold added that it was an act tending to the encouragement of dwellings for the labouring classes, and it was important to know why it had not been more generally brought into operation. It was desirable that they should know how far legislation had already gone in this matter. Probably, one great cause why Lord Shaftesbury's Act had not been adopted was the

existing high rate of interest for money. This brought him to a point which he thought should be fully discussed, viz., the legislation on this subject which had been applied to Scotland and Ireland, and which had not been applied to England. It seemed to him the great practical question was to get these buildings erected as cheaply as they could, and to hold out to capitalists generally the prospect of getting a fair and reasonable dividend. The moral and social parts of the question did not affect the capitalist. This question was growing in importance every year, and at the present moment when railways were being carried through the heart of London, a favourable opportunity for action in this great work appeared to offer.

The Chairman, in reference to the remarks of Dr. Hancock, said that gentleman had informed them of the existence of the Act which sanctioned the borrowing of money for improved dwellings, but he had omitted to state whether that Act had been put into force, and what had been the results of its operation.

Dr. Hancock replied he had not the statistics of the extent to which that Act had been brought into operation. In many districts of Ireland the population was diminishing, and so there was little or no demand for houses.

Mr. Harry Chester said it was clear to him that there were many points in which the interference of the legislature could be beneficially exercised in facilitating the objects they had in view. Lord Westbury's Bill for the registration of titles would afford facilities for ascertaining, clearing, and keeping clear the titles of owners of land, and for conveying by an inexpensive process the land of owners not under legal disability to convey it, but something further was necessary. What was wanted was, that the same facilities which the legislature had afforded for the conveyance of sites for schools, mechanics' institutes, museums, &c., should be afforded for the conveyance of sites for the houses of the poor. Probably more than half of the land in England was the property of persons having only a qualified or limited interest therein, and therefore under disabilities, viz., tenants for life, minors, lunatics, lords of manor, spiritual and other corporations, trustees for charitable and other purposes, &c. It had been found impossible in many places to procure suitable sites for schools apart from lands subject to these disabilities, and many Acts of Parliament had been passed to enable the persons really interested in such lands to make effectual conveyances of small portions of them, by sale or free gift, for schools for the poor. About ten years ago, through the instrumentality of the Society of Arts, an Act was passed (17 and 18 Vict., cap. 112*) which extended to the promoters of Literary and Scientific Institutions, Mechanics' Institutes, Museums, &c., the facilities which had been previously limited to the promoters of schools. Why should not the same facilities be afforded for the conveyance of sites for cottages and other homes for the poor? The precedents already set ought to be extended for that important object.

Mr. Shaw mentioned that under Lord Shaftesbury's Act, the consent of a majority of the vestry was required, as also the approval of the Secretary of State. Under these circumstances it was a question whether the working of that Act did not require simplification, and in any future legislation regard should be had to the enormous powers hitherto placed in the hands of vestries and other public bodies. In sanitary matters it was known that those powers were very large, and they also exercised interference in the building of houses. The medical officers of health were appointed by the same bodies. Then there were important powers with regard to overcrowding. The medical officer was bound to take proceedings before a magistrate, in whom were vested summary powers. With regard to the metropolitan vestries he thought it would be advantageous if gentlemen of position could be induced to take a more active part in them. Parochial bodies in general were now regarded as narrow-minded and prejudiced, and hence men of position did not like to have anything to do with them. Mr. Shaw concluded with some general observations on the details of building cottages.

Mr. S. Gregson, M.P., expressed his general concurrence in the observations of Mr. Shaw. A former speaker had spoken favourably of Lord Westbury's Act as bearing on this subject; and if its provisions could be carried out in the way suggested it would be exceedingly valuable to the poor man. He entirely agreed with the provisions of the bill submitted by Mr. Hare, for facilitating the easy transfer of small properties. He thought, however, that a permissive bill was seldom of much value. As to compelling railway companies to purchase more land than they required, he thought Parliament would never pass such a measure as that. The statement that building societies as a whole had not been successful was opposed to the impression he had always entertained. The chairman was quite right in saying they must not look to benevolent principles for the accomplishment of their object; the commercial principle was the only one that could be relied on. Then the next question came, how were they to construct these houses so as to make them commercially remunerative? One way of doing so was by means of loans from the government, on the system pointed out by the chairman. Referring to the returns of this description of houses, published by Mr. Twining, he found that the rents were on the average so low that he was afraid they would scarcely suffice to provide a sinking fund for the repayment of the loan.

Mr. G. Godwin, F.R.S., would very briefly refer to some minor points of legislation by which immense good might be done without much difficulty; but before doing so he would express his entire concurrence in Mr. Hare's Bill as to the facilities it would afford for the conveyance of land for these purposes; and as one of the committee of the Social Science Association he should gladly give it his cordial consideration and aid when it came before them. The last speaker but one had referred to the provisions of the Act for the prevention of overcrowding in dwellings, but he had overlooked the fact that it could only be brought into operation where it could be proved that others than the immediate family of the occupier filled the rooms, which in a great measure obstructed its operation. It had been exercised with the best results in the case of common lodging-houses. He thought it would be well that a short resolution should be proposed to the effect that it was desirable the supervision in the case of lodging-houses should be extended to all houses occupied by more than two families. This might be opposed to the maxim that "an Englishman's home is his castle," but it already existed where more than one family lived in one room. Till education in sanitary matters was more largely spread it was little use providing a large number of houses, unless they prevented them from being overcrowded. With respect to cellars, there were clauses in the Metropolitan Management Act and the Building Act which restrained the occupation of a large number of underground rooms, and the Act threw upon the district surveyor the task of proving those rooms to be so occupied; but the duties of the district surveyor ought to be confined to those of a structural character, and the inspection of these dwellings would be more properly committed to a sanitary police. He had been in cellars in Bethnal-green where men and women were literally dying for want of air and light in the basements, and the authorities appeared to have no power in the matter, simply because he believed the inspection was in the wrong hands.

Mr. Shaw was under the impression that in the Metropolitan Management Amendment Act it was proposed that the supervision in the case alluded to should be transferred to the Inspectors of Nuisances; but that clause was struck out in the House of Lords.

Mr. S. Redgrave thought that by placing these dwellings under the same regulations as applied to com-

* See *Journal*, Vol. II., p. 701, for the Act referred to.

mon lodging-houses, a task would be imposed upon the authorities which it would be impossible for them to carry out.

Dr. Greenhill said the idea of borrowing money from the government at a low rate of interest, for the purpose of building houses for the labouring classes, as proposed by the Chairman, appeared a very valuable one, but was hardly likely to be carried into effect in this country. He found some years ago that in Paris, where the government wished to provide additional small houses, in order to replace the great number that had been pulled down in the course of the recent improvements of the streets, &c., landlords were encouraged to build this class of houses by having a remission, for a certain number of years, of a portion of the municipal rates and taxes; and possibly something of this sort could be done in England, wherever an urgent want of poor cottages could be proved to exist. As to facilitating the process by which a poor man might become the owner of his own house, he confessed he did not think such a result generally desirable, as the difficulty of keeping cottages clean, and preventing overcrowding and immorality, which was at present very great, would be immensely increased if each house were to be the absolute property of its tenant, who would, of course, allow of no interference with an Englishman's rights over his own "castle." With respect to cheap trains for the purpose of taking the labourers a few miles out of town, he thought that they might be useful in some cases, but not universally, as he had found by experience. It had so happened that the directors of the London Labourers' Dwellings Society, with which he was connected, had been obliged to part with some of their houses to a railway company, and he had inquired of the tenants whether, if small houses in the country were provided for them, they would be willing to live in them. They all, with one exception, said that as their work was only casual, not regular, such a situation would not suit them at all, as it was necessary for them to be near the spot where their work lay. He thought it better not to wait for assistance from government, or any change in the legislation, but to carry out the plan of buying up and improving unhealthy houses by means of joint-stock companies, which, if properly managed, were able to pay a dividend of 4 or 5 per cent. This rate of interest was not sufficient to induce merchants or builders to invest their money in such schemes as a commercial speculation, but it would be found a convenient mode of investment for ladies or other persons who had no more profitable mode of employing their money. This was the case at Hastings, where about one-half of the capital of the Cottage Improvement Society (now amounting to £17,000) was subscribed by ladies, who received a regular half-yearly dividend at the rate of 5 per cent. per annum, without risk, trouble, or expense, and with the additional satisfaction of making their money useful to the community by helping forward the great work of sanitary reform.

Rev. T. Pyne thought the system of suburban residence might be adopted to a considerable extent in the case of workpeople such as watch-makers, boot-closers, &c., who worked at home, and did not require to attend the premises of their employer more than once or twice a week; and the system of cheap trains would facilitate that arrangement very much to the relief of the metropolis. He had himself built several cottages thirteen miles from London, and they answered very well.

Sir Christopher Rawlinson said this question had been anxiously debated in two societies to which he belonged, but they had not arrived at any practical conclusion, except in respect of the bill submitted by Mr. Hare. The two simple points of adopting Lord Westbury's Act, and following that up by transferring by registration, free from all those incumbrances which were created by the present law of real property, would be of immense benefit both to town and country. The question was, what could be done by legislation to enable persons to invest their money in cottages so as to be remunerative. He had built cottages, but they gave him a very poor return for the outlay. He thought the indirect advantages were hardly a part of the question. Everyone would admit it was a great blessing to have a healthy population about him, but the difficulty was to make this description of property pecuniarily remunerative; and on this subject he was brought back to the suggestion of the chairman as to public loans. The great question in his mind was, if government advanced money at 3½ per cent., whether cottages could be erected to pay 5 or 6 per cent. That was the whole difficulty. He had built cottages at a cost of £110, for which he got £4 4s. rent per annum, and that could not be said to be remunerative. With regard to London, he thought the case was not one of so much difficulty. The opportunities of association were so much greater, and, from the higher wages of labour, there was a better prospect of obtaining remunerative results.

Mr. Hickson could conceive no measure of greater practical importance than compounding for the fiscal and parochial charges upon improved dwellings for the working classes, inasmuch as the burden of taxation pressed very heavily on property of this description, and went far to prevent its extension both in town and country. Mr. Hickson entered at some length into the question of taxation of house property, and contended that modifications were required before they could hope to see any great extension of building for the class they desired to benefit.

Mr. G. H. Whalley, M.P., would call back the attention of the meeting to the practical remarks which had fallen from Sir Christopher Rawlinson. There was no want in the present day of good models for cottages, but the practical difficulty was how to get the money to build them. They could not get it under the Acts of Parliament which had been in operation for some years; and even if further power were given by legislation the difficulty would still be to show that they could get sufficient interest for the money. He thought a short act might be introduced, by arrangement with the Enclosure Commissioners, for giving the same facilities for borrowing money for the building of cottages that were now afforded in the case of drainage.

Mr. E. Akroyd said, in order to judge of what might be done by legislation, they must first consider what had already been accomplished without legislation. It must be admitted on all hands that the principles of political economy had failed to give to the working classes what they were now endeavouring to secure for them. Naturally the object of a builder was to erect cottages as cheaply as possible, and get the utmost rent for them. The result had been in his own neighbourhood the erection of a flimsy and cheap class of cottages with inadequate accommodation; in fact it might be said that the erection of that class of buildings had created many social evils which they had now to grapple with. The purely commercial principle had hitherto failed, and would fail in accomplishing the object they had in view. He next came to the philanthropic principle. Taking that abstractedly, they must admit that though they saw many beautiful structures erected by philanthropic gentlemen, yet those were isolated cases, and they could hardly expect, from such motives only, to do much to raise the character of the dwellings of the working classes. He, therefore, came to the consideration of the possibility of a compromise between the two principles. As a large mill-owner and employer of work-people, he had erected 100 cottages for the workmen attached to some mills near Halifax. These cottages consisted of three classes. No. 1, costing about £120, was let at £5 15s. He did not say he erected those buildings from purely philanthropic motives, because his object was to attract the best workmen to the neighbourhood, and in order to do that, it was necessary to have a better class of cottages for them to live in, and the results, he was happy to say, were satisfactory both to the employer and the employed; the latter rejoiced at having comfortable residences, abundantly supplied with all requisites, at a low

rental, while the former, by offering the houses at a lower rental than others, attracted a better class of workmen. He thought large employers of labour would find it to their interest to erect this class of buildings for themselves. His second experiment was carried out at Haley-hill, where he purchased ground to the amount of £10,000. The erection of houses to cover the whole of that plot would have amounted to a serious sum; therefore the problem he set himself was this—"Can I induce the workpeople in my neighbourhood to join me in the erection of a superior class of cottages on this land, so that, in the end, they may themselves become the proprietors of those cottages?" For that purpose he placed himself in communication with Mr. Gilbert Scott, in order to obtain designs for cottages in the old English style. He was aware that this might be more expensive; but he discovered that every workman liked a distinct house, and also preferred a residence pleasing to the eye. He, then, in conjunction with his workmen formed the Akroydan Building Society, and they placed themselves in communication with a benefit building society in the locality, to ascertain the terms on which it would advance money for the erection of blocks, on plans to be mutually approved by himself and the workmen as future occupiers and owners. Terms were arranged under which the building society advanced money, which, by a payment of three shillings per week, was to be repaid in $12\frac{1}{2}$ years. In his first experiment, for the sake of economy, the houses were built back-to-back; but in the second case he was determined to carry out the "model cottage" in every respect, and he found it was impossible to build such a house as he wished to see the better class of workmen live in, for less than £190, including land. It might be said that failed to provide a cheap class of house for the poor; but indirectly it did so, as it was found the superior workmen vacated existing cottages elsewhere, leaving them to be taken up at a lower rental by others. If he found it necessary to erect a cheaper class of houses he should be compelled to adopt a system which he by no means recommended. The blocks he had erected had all been taken up. He was at present building 40 other houses, the erection of which was carried on under his own superintendence, having first obtained the assent of the future owners to the plan. He guaranteed them that the houses should not cost beyond a certain sum, and he took care they were substantially built. He had great pleasure in stating that a new town was rapidly springing up in the neighbourhood, peopled by the best class of workmen. As soon as a block was finished he was repaid for the land by the building society, and in that way he gradually recovered the whole of his expenditure. The plan adopted at Halifax had been successfully imitated in other places, particularly in Leeds, where large plots of land had been purchased on which dwellings of superior design would be erected. It might be said that in some instances building societies had been failures, but for his own part he was amazed at the development of the co-operative system. In three towns in the West Riding of Yorkshire no less a sum than £1,200,000 had been raised in this manner. If that were so, they might look to those building societies to advance much of the capital required. The money was borrowed in many instances at 3 and 4 per cent., and they paid their proprietors 5 per cent. Those societies were a sort of savings bank, and there were great inducements to deposit capital in them. He thought the system he had pointed out was capable of indefinite extension in country towns, but when they came to deal with London the matter was totally altered, and they must consider the question in entirely another point of view. If they wanted dwellings in the centre of the metropolis they must adopt the mode of constructing in flats which would accommodate in one block forty or fifty families. Then came the question, how could they make the occupiers of these flats the future owners of them? To that he would reply, the capital might be raised under the Limited Liability Act. From what he knew of working men, they had great pride in becoming owners of their houses. It was found, when they wanted to raise funds for purposes of their own, the money came in in a most extraordinary manner. Large cotton and worsted mills had been erected upon the co-operative system, and what they wanted was to stimulate a similar spirit in London with regard to dwelling houses. The houses erected by Miss Burdett Coutts showed that such buildings could be made to yield a fair return for the outlay. His own experiments had been on the whole successful, and he was happy in the thought that it was not an isolated case; and when they came to the next head of the subject, viz., "What assistance could be given by this Society," he would recommend that the fullest information possible should be obtained of all the experiments actually made, so that facts should be adduced rather than theories, and the statements of those facts should be circulated for the benefit of the members.

Mr. Bowkett strongly advocated the co-operative principle as a means by which the enormous sums yearly paid in rents by the working classes of this country could be converted into capital for the purchase of the houses in which they lived, by weekly subscriptions within the means of all classes of the labouring population. He also explained the working of the building societies associated with his name, which, he said, had been in operation for more than 25 years with the best results, and were now rapidly spreading in every part of the country.

Rev. S. Tenison Mosse (of Dover) said, having seen the evil effects of crowding of dwellings in his own town, he made application to the government, and succeeded in obtaining a site of seven acres at the price of £250 per acre, all expenses included. He then started a society, under the Limited Liability Act, for raising funds for building cottages on that site, but owing to various causes he did not succeed in getting a sufficient number of shareholders, although he promised them 5 per cent. for their money; for he held it was the commercial principle which must be brought before the public in this matter. Upon the issuing of the prospectus, showing a dividend of 5 per cent., shares to the amount of only £1,000 were taken, upon the faith of which, however, he entered into a contract for six pairs of cottages. By means of loans to the amount of £3,200 in addition, he succeeded in planting 24 cottages, and had paid off the £1,750 to government for the purchase of the land. If the plan suggested by the chairman, of borrowing public money at $3\frac{1}{2}$ per cent., with a sinking fund of $1\frac{1}{2}$ per cent. or higher, according to the returns, were followed, he had no doubt within two years he should be able to plant 100 cottages where there were now only 24. The rate of interest should depend on circumstances. In London and towns like Dover, where labourers earned from 18s. to 21s. per week, it would be absurd to place the rate of interest on a par with that in Wiltshire or Dorsetshire, where the rate of wages was from 8s. to 12s. per week. If the landed interest of the country were to make the labourers comfortable as regarded their dwellings, they must come forward for that purpose in a way they had not yet done. So successful had been the operations in Dover, though only on a limited scale, that he had been induced to erect cottages elsewhere, and had found them profitable. With reference to the co-operative system which had been advocated, there was no doubt artisans in towns earning good wages might eventually become the owners of the houses, but to ask even 5d. a week from the agricultural labourer for such a purpose, would be asking him to do an impossibility, and the monied classes must be satisfied with a lower rate of interest to enable the labouring class to live with comfort and decency.

Mr. Alderman Waterlow, upon the question—"What could be done with legislation?" understood the principal suggestion to be that the government should be authorised to advance money for building speculations, taking proper security. He fully agreed in the propriety of such a course, and all future operations in this direction would

have the advantage of the experience already arrived at; but there were two other points he would throw out for consideration. Those who had had much experience in the management of property of this kind, in neighbourhoods where the labouring classes chiefly dwelt, and which, in London, were the most expensive parts as regarded the rates, must have found that the local rates were a great burden upon this class of property. He thought the attention of Parliament should be drawn to the question of furthering the equalisation of the poor rates. He wished the meeting to consider the bearing it would have on this particular class of property. There had been some dwellings of this kind erected in the Tower Hamlets and in Shoreditch, in both of which districts large numbers of the labouring classes lived, consequently the poor rates were very high. Surely Parliament could be made to see it was very unfair that the poor working man should pay out of his income a much larger proportion of his earnings for rent than the higher classes. The legislature might at least equalise the poor rates to the extent of making each town pay one rate throughout its area. If that were done in the metropolis it would be a great benefit to the labouring classes, because it would reduce their rates materially. Another point was, Parliament should be asked to consider whether, with regard to local rates, the man of limited income was not entitled to some concession, as was now the case with regard to government taxes. The local rates had increased very much during the last 15 years, and the poor rates were larger in amount than the state taxation. What was the purpose of local taxation? It consisted principally of the poor rate. Of the paving and lighting rates the larger streets had the chief benefit, while the poorer streets were badly lighted and ill-paved; yet the poor man had to pay as large a per centage upon his rent for those rates as the man who lived in the larger streets. He would suggest that a reduction in the local rating upon tenements under the rent of 5s. per week should be made.

Rev. T. Pyne said, under the general act of Parliament cottages under £6 a year were only rated one-half.

Mr. Alderman Waterlow believed that act applied to cottage property in the rural districts only. He was speaking of blocks rated at £150 a year, but if that exception were made in the case of separate cottages, he did not see why it should not be extended to larger properties, let out in small tenements below the rental of 5s. per week.

Mr. Sparke (of Crewkerne) said he was the owner of a considerable number of cottages in a country parish, and his plan was, as existing cottages came into his hands to put them in thorough repair. He could fully confirm all that had been said with regard to the rating of cottages and the exceptions made in country parishes, and under that system it could not be said that the rates were heavy on that description of property. He had recently built two blocks of cottages in the country, and in doing so looked to other benefits than the mere pecuniary return they yielded.

Mr. S. Redgrave remarked, that the relief suggested with respect to the local rating would not benefit the poor man in London who occupied one or two rooms in a large house, but the benefit would be on the part of the middleman. They had discussed at some length the question of railways running through poor properties, and he thought they might fairly ask that where large populations were dislodged, some provision should be required to be made for them elsewhere. He thought it would not do for them to ask Parliament to make any great alterations in the law of property, but they might adopt a portion of the suggestions of Mr. Hare. Parliament had never yet been called upon to legislate with the view to the working man owning property of this kind. It was entirely a new question, and the provision of Mr. Hare's bill would fairly apply to it. They must all feel how well Mr. Alderman Waterlow was acquainted with the wants of the working classes, and how heartily he had strived to meet them. Mr. Akroyd had shown what could be done by co-operation, and he should rejoice to see the system that gentleman had introduced largely extended over the country.

Mr. H. W. Freeland was anxious to express his emphatic conviction as to what the legislature could do in dealing with this question. He thought Mr. Alderman Waterlow had hit the right nail on the head in his remarks on the areas of rating. Parliament also might do much towards cheapening the cost of transfer of small properties of this kind. Whether this should be done under Lord Westbury's Act or under the Bill proposed by Mr. Hare, or by a combination of the two, he would not now inquire. He had no doubt a great deal might be done by the practical suggestions embodied in Mr. Hare's Bill. He would remind the meeting that there was an Act in force under which the conveyance of property was very much simplified—that was Lord Brougham's Act—and if gentlemen would insist upon their solicitors applying the provisions of that Act to the transfer of cottage property, it might be conveyed at a very small expense. He had invariably done so, though the Act itself was not much in favour with solicitors. The question of rating was a large and difficult one, and, in his opinion, nothing satisfactory would result from legislation in this direction till an effectual blow was struck at the system of close parishes. He would call the attention of the meeting to a very valuable pamphlet on this subject, written by Mr. G. Poulett Scrope in 1849, and perhaps they would allow him shortly to quote what that gentleman said on the subject. The principle laid down by Mr. Scrope was the establishment of a common rate in every union for the relief of its poor, in the place of separate parochial rates, and he stated—"This change is imperatively needed to put an end to the motive which now so strongly and generally induces the owners of 'close' parishes, and the principal ratepayers of all parishes, to discourage in every possible way the residence of poor persons, or of such as may by possibility become poor, within the limits of their particular parishes—by pulling down or leaving to decay existing houses—by preventing the erection of new ones—by setting their faces against those who may endeavour to supply the demand of an increasing population for house-room. The object of course is to avoid the burden of maintaining the poor out of the parish rates—even the labourers who have worked all their lives perhaps in the parish, when through sickness or old age they may become chargeable on the place of their residence. The extent to which this very disgraceful but yet very universal motive is in active and constant operation through the length and breadth of the land (but of course in successful operation only in such parishes as are in the absolute power of one, or a very few individuals, who are consequently able to regulate the number of houses they may choose to permit the existence of within their limits) is perhaps little known." It was in this direction he looked for the remedy of the main evils of the present system of close parishes with regard to the providing of cottage accommodation. The writer went on to state:—"The poor, by this contrivance, are, to a great extent, compelled to support the poor, while the wealthy escape even their fair share of taxation to this object. Instances of this abuse are probably within every one's knowledge. In the metropolis, for example, the parishes of East and West London, and Bethnal-green, inhabited chiefly by the middle and poorer classes, pay a poor-rate, the former of from 3s. 2d. to 1s. 8d. in the pound, annually; the latter of 2s. 4d.; while the parishes of St. James's, Westminster, and St. George's, Hanover-square, being chiefly inhabited by the wealthy classes, pay only, the first 1s., the latter but 7¾d. in the pound; that is about one-fourth only of the rate imposed on the struggling weavers and shopkeepers of the first-mentioned districts of the same city. In the Tamworth Union, the town of Tamworth pays 5s. 6d., while two adjoining parishes pay only 1½d., and one only 1d. in the pound! In the Frome Union, five parishes pay severally above 5s. in the pound, while five others pay less than 1s.—one

only ½d.! In the Thingoe Union one parish actually pays 13s. 10d. in the pound, while six parishes pay less than one shilling!" Many petitions from parishes, praying for the redress of this crying grievance, were mentioned by Mr. Scrope. He would quote one only from the pamphlet in which the cause of the injustice complained of was clearly pointed out. A petition, presented by Mr. Henley, from the parish of Watlington, in Oxfordshire, stated—that "the rates for the relief of the poor in that parish, in each of the last two years, amounted to 10s. in the pound," while "the adjoining parish of Britwell Prior had been charged with no rate whatever, and other parishes had paid very trifling rates." The parties declared that this inequality arose from "the parish of Watlington being surrounded by a number of small *close* parishes, which are deficient in cottage accommodation, and of whose labouring poor many reside in the town of Watlington." He had risen for the purpose of saying that he thought that the legislature might, by some such provisions as those embodied in Mr. Hare's Bill for cheapening conveyances, and by striking a blow at the system of close parishes, do a great deal of good in this question, and more than could be done in any other way. Upon the subject of exemption from rating he did not approve of that principle in the abstract, but in this case they had such enormous difficulties to contend with, that he thought they might be justified in asking that in the case of new dwellings of this class they should be exempted from poor rates for a limited period.

After a few words from Mr. Mortimer, further pointing out the effects upon property of the present system of parochial rating,

Mr. Harrold remarked that there was fear of the system of public loans being abused. Where a society was formed to erect cottages, or where a gentleman wished to better furnish his estate with cottages, it would be a manifest advantage to appropriate a portion of the public fund to that purpose; but all through the country there were speculative builders, who erected rows of houses, which, although they were an improvement upon the present wretched dwellings, were not built upon proper sanitary principles. They made their speculation pay, but they did not build for real permanence. It would therefore be requisite that the plans should be submitted to a proper officer before the money was advanced.

The Chairman then read the following resolution, as embodying the views of the meeting:—

"Resolved—That the legislature can promote the erection of proper and sufficient dwellings for the labouring classes:—

"1. By loans at low rates of interest, repayable within a limited time and under proper security and conditions, for building dwellings and cottages upon the precedent of the Dwellings of Labouring Classes Ireland Act, 1860 (23 Vic., c. 19), and other similar acts of the legislature.

"2. By assimilating the law of this country with that of Ireland and Scotland (Tenure and Improvement of Land, Ireland Act, 1860, 23 and 24 Vic. c. 153, Act for Facilitating the Building of Labourers' Cottages, 1860), in giving facilities for obtaining advances on the security of settled estates.

"3. By throwing upon public companies requiring houses inhabited by the labouring classes, for their own commercial purposes, the obligation of erecting an equal number to those destroyed.

"4. By improvement of the Lodging-house Act, as regards provision for sanitary purposes, and giving greater power to inspecting officers.

"5. By giving facilities to owners of property, under disabilities (such as tenants for life, minors, &c.), for conveying sites for building cottages upon the principle of the Montgomery Act in Scotland (10 Geo. III., c. 31) and the Tenure and Improvement of Land in Ireland (23 and 24 Vic., c. 153).

"6. By cheapening the cost of title and transfer of property, so far as affects cottage property.

"7. By enabling cottage property and labourers' houses in towns, and the sites of such property, to be registered under local authorities as personal property, transferable as to local registry alone, in the same manner as government stocks and railway shares.

"8. By abolishing the law of settlement, and extending the present limited area of assessment for local taxation, so as to equalise the payments of all classes."

Dr. Gibbon supported partial exemption from rating as a bonus for the erection of dwellings for the poor. It was, he said, a principle already recognised by Parliament, and might properly be extended to this description of property.

Mr. S. Redgrave still thought the benefit would be derived by other parties than those for whom it was intended.

Mr. Akroyd objected to government loans for building cottages, and contended that the objects could be better effected by the co-operation of the working classes themselves.

Dr. Hancock remarked that as the erection of cottages must be admitted to be an improvement to an estate, he saw no objection to the extension of the principle which was recognised in the case of drainage, &c.

The Chairman added that in both cases the object was the improvement of an estate, and the ultimate benefit of the community at large. The principle appeared to him to be identical.

Mr. Akroyd individually protested against the portion of the resolution which had reference to public loans.

The resolution was then agreed to.

It was further resolved—

"That the Council of the Society be requested to take steps for giving effect to the recommendations of this Conference."

Mr. Alderman Waterlow, upon the proposition, viz., "What assistance, if any, can the Society give in either of the proposed directions," said the Society had done a great deal, and might do still more, to forward the objects they had discussed. In the first place, he suggested that they should form a permanent committee of a few members of their own body, for the purpose of receiving communications that might be forwarded to them, and taking any steps that might be thought necessary. Another way in which they might forward the object would be by taking steps to procure the best form of articles of association for the general adoption of societies formed for building these dwellings. Another point he thought was for the Society to continue the laudable object of offering prizes for designs for cottages, inasmuch as he had heard with regret that, numerous as were the designs sent in for competition for Mr. Bailey Denton's prize, yet there was a lack of such designs as were wanted.

Upon the motion of Mr. Akroyd, a vote of thanks to the Chairman for the able and courteous manner in which he had presided over the proceedings of the Conference was passed by acclamation, and the meeting adjourned.

Mr. John Walter, M.P., writes to the Secretary as follows:—"As I expect to be engaged on Parliamentary Committees on both the days appointed for the Conference, I regret that it will not be in my power to attend it; but I venture to trouble you with a few remarks, embodying the substance of what I should probably have said had I been able to be present on that occasion. 1. There can be no doubt as to the fact that the accommodation for the labouring classes, both in town and country, is inadequate both in amount and in quality. To what extent, however, this is the case is a question almost impossible to solve. 2. The effects of such a deficiency of accommodation cannot but be injurious both to health and to morals. This proposition, however, admits of many exceptions. A bad cottage does not necessarily imply sickness and vice, any more than a good one implies health and virtue. I have seen many cases which prove the contrary. The proposition is only true in a general way. 3. Of the various causes to which these evils have been attributed, the difficulty of providing proper dwellings at a remunerative rate is, in my opinion, the only one of any serious importance. Undoubtedly, I think that the law of settlement, taken in connexion with the limited area of rating for the relief of the poor, has operated, and probably does still operate, as a hindrance to the

erection of new cottages, and as a premium on the destruction of old ones. In any case, I think that the law should be altered, and that the area of rating should be made co-extensive with the area of management. A man's settlement would then be more likely to become what it was obviously intended to be—industrial, instead of residential—and he would be entitled to rating, if necessary, in the district in which he had bestowed his labour, instead of in the parish in which he had merely resided. 3. I don't believe that the limited tenure of property, such as generally prevails throughout the country, has much to do with the matter. A tenant for life, with plenty of money in his pocket, is more likely to build cottages than a tenant entail or in fee simple without it. While on this branch of the subject, I may observe that the worst cottages, beyond comparison, that I have ever met with, are those which have been built by labourers themselves upon small freehold plots of ground originally stolen off the edge of a common. Any one who will examine the cottages situated in such localities, may convince himself of the truth of this observation. On the other hand, the best cottages are those which are built by gentlemen for their own tenants and labourers; but these are not remunerative in a pecuniary point of view, nor do I know how they are to be made so. 4. With regard to the remedies. I am of opinion that nothing of a compulsory nature can or ought to be done by legislation. The only way in which the legislature could interfere appears to me to be:—(*a*). By lending money to landlords who may be desirous of building new cottages for their labourers, upon the same principle as is now done with loans for drainage, and by enabling them to charge their estates for that purpose. (*b*). By exempting all cottages below a certain value from assessment to poor rates. I believe that the Society of Arts cannot render the slightest assistance in the matter; and that all premiums, prizes, plans, and medals which it may offer for the purpose, are mere moonshine."

Mr. Harry Maynard, in a letter to the Secretary, says:—"It is understood that the average rate realised on first mortgages on land throughout the country is 4 per cent. per annum. I suggest that a large institution may be formed upon this basis, which would, at least, involve no sacrifice on the part of its supporters. This institution would borrow money at this rate of interest, and, after laying it out in cottages, would receive returns enabling it to pay demands with the same regularity as the public funds. No further aid or assistance would be required from the government after securing this object. That a margin of 1 per cent. per annum is sufficient for all expenses, I conceive to be shown by the present existence in the City of London of more than one company who accept funds for investment in our colonies on the same terms. There is one whose operations are in Canada, where there is £250,000 invested in land mortgages, thus earning £2,500 per annum with no occasion for any capital at all beyond what may be required to supply the arrears of interest due by their colonial constituents at the period of payment of their dividends in London. The method of appropriation of such funds I would leave to others, as well as the rules by which the property of the institution should be governed. I imagine that every county or considerable city might have its branch, and that supporters would be found in every one. Cultivators of land and proprietors would gladly contract to pay 5 per cent. per annum for a stipulated outlay in cottages, according to their wants, and if the institution confined itself to this branch only in the first instance, very great good might be effected."

Proceedings of Institutions.

Hastings Mechanics' Institution.—The 31st annual report, presented at the annual meeting, held May 4th, 1864, says that the classes, during the last year, have achieved a greater success than for several years past; and five classes are now continuing their studies, namely, first French class, second French class, arithmetic, drawing, and writing. In order to stimulate exertion in this department of the Institution, the committee have offered prizes for proficiency. The income for the year was £185 18s. 7d., and the expenditure £141 4s. 7d. The balance of £44 14s. shows the exact financial state of the Institution, there being no outstanding debts. The society does not depend on any extraneous efforts for an existence, for in the ordinary working of the Institution for the past year there was a saving of £18 2s. 8d. Fourteen lectures were delivered during the past session, among which may be mentioned one by G. Dawson, Esq., M.A., on "Wellington and Napoleon;" one by F. North, Esq., M.P., on "Rivers and Mountains;" one by T. Brassey, Esq., jun., on "Algiers;" one by S. Sharpe, Esq., "Mythology of Ancient Egypt;" and one by Dr. Hunt, "The Theories of Man's Origin." The receipts from the lectures were £17 9s., and the outlay £11 19s. 4d.; thus showing, that instead of a loss, as in past years, the lectures have been a source of revenue to the amount of £5 9s. 8d. 138 volumes have been added to the library during the year, and 3,033 vols. have been in circulation amongst the members. The present number of members is 320. In concluding their report, the committee congratulate the members on the healthy life of the Institution.

Newbury Literary Institution.—The twenty-first annual report notices the continued prosperity of the Institution, the present number of members being 316, an excess of 23 over those of the preceding year. The numbers of members has been steadily increasing for years past. The library has been replenished during the past year with many valuable works. The lectures have been particularly attractive and interesting, and the attendance has been larger than during any previous year. Professor Pepper's Ghost Lecture, at the Corn Exchange, was attended by no less than 1,600 persons, and the exertions of the committee were rewarded by a net surplus of £29 13s. 9d., which has been appropriated in reduction of the building debt. The reading rooms have become an important branch of the Institution, and are supported by 140 members, chiefly composed of the younger class, who frequent the rooms in the evening, and recreate their minds by the reading of periodicals and papers, and the study of literature. The present available balance in hand, against the mortgage debt of £600, is £62 16s. 11d. The statement of account shows that after the payment of all expenses there remains a balance of £5 13s. 10d. in the hands of the treasurer, the receipts having been £277 4s. 5d.

Salisbury Literary and Scientific Institution.—The last annual report says that the number of members is still increasing—the average having been 284 for the year. The attendance in the reading-room has considerably increased, the lectures have been well attended, and the number of volumes issued from the library during the year has increased to 3,552. The library has been still further increased by the addition of 30 new books, and now contains nearly 1,600 volumes. Among the lectures delivered during the year were one by the Rev. Prebendary Fane, on "Wellington, and his Campaigns;" one by Henry Fawcett, Esq., on "The effects of the recent Gold Discoveries;" one by the Rev. T. D. C. Morse, on "The Life and Times of Cardinal Wolsey;" and one by Mr. B. Waterhouse Hawkins, on "The Gorilla and other Monkeys compared and contrasted with Man." In the finance department there is a slight deficiency, there being a balance of £15 against the Institution on the year. This has been incurred by several extraordinary items of expenditure. A magnificent microscope, presented to the Institution by some of its friends, is now at the service of the members; and arrangements will be made whereby it shall be available to them, either at the Institution or at

their own homes. The Institution is now self-supporting, and only needs the sympathy and co-operation of its members to ensure its permanent prosperity.

Welch-Pool Reading Society.—The report for last year says that a house has been taken in New-street, for twelve months, which will prove, it is hoped, far more convenient to the general body of the subscribers than the unsuitable premises lately occupied. The committee have also been able to secure the services of a resident sub-librarian. It has been suggested to the committee that it would greatly increase the usefulness of the society, and possibly add to its numbers, if they were to subscribe to a London lending library, so as to obtain a constant supply of fresh books. This must depend upon an increase in the subscriptions. The financial statement shows that the expenditure has been £58 17s. 4d., and that there is a balance due to the treasurer of £4 12s. 10d.

GOLD MINING IN VICTORIA.

By Mr. Philip A. Eagle.

[*Continued from page* 484.]

QUARTZ MINING.

Chap. III.

Number of Reefs Discovered—Area of Distribution—Improvements in Crushing—Geology of Gold-bearing Rocks—Practical Remarks on Quartz Veins and Depth of Lodes—Statistics.

Great as have been the profits realised from alluvial mining, these have been surpassed by the working of the quartz veins of the colony.

The importance of this latter branch of industry it is difficult to overrate, whether regarded as giving a permanent character to gold-mining enterprise, making it a staple pursuit, or as the source whence the chief supply of the precious metal must ultimately be derived.

In traversing the up-country districts one cannot avoid being struck with the attention and labour now systematically bestowed on quartz mining by both large and small companies. It appears that there are upwards of 1,800 distinct veins of quartz laid down on the mining maps; and, simultaneously with the progress of the "prospector," improvements in the mode of extracting the precious metal have taken place. The lowest charge for crushing is about ten shillings per ton, but quartz, containing *eight shillings worth of gold per ton,* is made to yield 24 per cent. upon a considerable capital by the reduction of a large quantity of stone per week. At Ballarat, with improved machinery and plenty of water, this is a profitable investment; and the poorer quartz is now being generally experimented upon, while five or six years back quartz could not be reduced at a profit if it contained less than one or two ounces of gold per ton.

The immense importance of the recent improvements in quartz-crushing will be understood, when it is stated that while reefs yielding from two ounces and upwards to the ton are not uncommon, those averaging from a quarter to one ounce per ton are found to intersect three-fourths of the total mining area. A reference to the map of the colony will furnish the best illustration. By drawing a line from Anderson's Creek (the first gold field opened) to the mountainous ranges of Gipps Land; thence in a northerly direction as far as the Beechworth (Ovens) division, which also includes Chiltern, the Buckland, and Wahgunyah; then taking a westerly course, traversing the Waranga, Mac Ivor, Bendigo, Inglewood, and Tarnagulla fields, penetrating the Upper Pyrenees and Wimmera district as far as the slopes of Mount William, and returning along the south-western fields of Ararat, Ballarat, and Steiglitz, to within a few miles of Geelong, the reader will perceive the extent of country over which quartz veins are proved to exist.

The science of geology divides the vast length of time from "the beginning" into three periods:—the Primary, Secondary, and Tertiary. During the first of these we have the volcanic rocks, the slates, sandstone, coal and limestone formations, over which, during the latter period, the clay marl and sand have been deposited.

It is in the primary or lower palœozoic rocks,* that the quartz veins occur. These rocks (slate and sandstone) have been formed by the action of water, and when in their original position were from 3000 to 6000 feet in thickness, but by the upheaval of the granitic rocks, they have been thrown upon edge, the disturbance causing numerous fissures in them, which have since been filled with silica; how, has not yet been satisfactorily determined. To form any adequate idea of these operations, the mind must discard all notions of time; ages must be regarded as minutes, and cycles as years. Frequently whole rivers have been covered in, and form what are known in alluvial mining as wet leads.

The quartz veins invariably assume a true meridional direction† and are inclined either east or west, varying in their 'dip' from horizontal to nearly vertical.

Unlike the well-established characteristics of inferior metals (from a knowledge of the elimination of which much of the present theory and practice of working quartz veins doubtless have been derived), the elements which should enter into some preliminary calculation in these ventures are often difficult of investigation, though when once fairly determined, there are perhaps few undertakings which are more remunerative in character than a well-won quartz lode.

The indications of auriferous stone in the Victorian mines, in some cases resemble those which are found to exist in the copper mines of England. Masses of quartz, having frequently a burnt appearance, with iron oxide, lie along the line of reef, forming beneath the surface what is called a 'flucan' or lava streak. Thus, 'cropping out' on the surface, gold-bearing stone is sometimes directly traceable, but more commonly the lode is connected at a greater or lesser depth, by a spur or 'leader.'

Sometimes a vein of auriferous quartz, when followed down from the surface, in seeking for a reef, will for a considerable distance lose all trace of golden stone, until (as in the case of the Maryborough "Mariners") the main reef is reached, perhaps at a depth of 300 or 400 feet; and it is in such cases that the confidence and pluck of the miner are most severely challenged.

At other times a succession of leaders will be found, each containing gold, and carrying to the reef.

Occasionally surface seams are disclosed which contain the richest stone, thus compensating for their deficiency of width, but generally they lose all value after being tried to some depth when unconnected with a proper lode. Many of the reefs have been discovered in alluvial workings, both in sinking and in tunnelling, not unfrequently forming the bed-rock of a shaft; but it is invariably found that those which are opened and followed down from the surface yield the most satisfactory results.

A number of the principal reefs consist of a succession of blocks of quartz, separated by masses of sandstone and slate. These blocks or "makings," as they are termed, are found of various thicknesses, and extend to an un-

* Mr. R. B. Smyth (the secretary for mines) says: "These older rocks, with the mineral veins which they contain, have been subject to extensive denudation. A considerable vertical height has been ground down through the lapse of ages, and again deposited in beds of greater or lesser thickness in the adjacent valleys. Modern changes, such as take place daily, owing to the action of the weather, are continually tending to the deposit of auriferous sands and clays in the beds of the *gullies* and small watercourses."

† An exception to the general form of deposition exists at Wood's point, the seat of the late discoveries on the Upper Goulbourn. There the gold is found in veins running east and west. This is also the case to some extent at Rushworth and Waranga, where the direction of the rocks is a few degrees north or south of east.

ascertained depth. Other reefs, again, are formed of an unbroken body of quartz, workable throughout. The width of the reef will vary considerably, a paying lode sometimes reaching to thirty, and even as wide as fifty feet, at other times narrowing to a mere thread; while it will also occasionally happen that after considerable working the lode will be lost for several feet, or it may split up into leaders and be again recovered.

A number of the reefs now working were first "laid open" in the early days of alluvial mining, where rich surface ground led to a few feet of rubble and "casing" being broken up, when in default of the presence of payable gold, added to the digger's ignorance of the theory of gold deposits, these claims were abandoned to be afterwards developed into mines of almost inexhaustible wealth. It not unfrequently happens that when the upper portion or "cap" of the reef, which is often very rich, is worked out, the claim is deserted, either from its supposed exhaustion. or from an uncertainty of the lode.

The difficulty of properly tracing out a lost lode has often led to the surrender of valuable ground, and this perhaps has been experienced more especially in leaders which, after being carried down successfully to various depths, have failed, and were supposed to have run out; whereas, with a better knowledge of working quartz veins, in all likelihood a recovery of stone at a greater or lesser depth would in such cases be made, perhaps equally as valuable as at the upper part or cap.

With regard to the permanent productiveness of gold-bearing lodes, it may be stated that at the Maryboro', Sandy Creek, and Inglewood mines (the two latter large and important reefing districts) it is found that after the "upper lode" has been penetrated, and a permanent vein carried down, the stone continues to improve in quality as the reef is developed; and where this increase fails, it still generally sustains the average of previous yields. And although this experience is not likely to prove the rule throughout the colony, it has sufficiently established its importance to override the usually admitted theory of gold-bearing rocks, and is equally opposed to the dicta of our most eminent geologists, who have prophesied the exhaustion of "gold deposits" and "auriferious veins" at great depths. It may be that a majority of the Victorian reefs will betray signs of exhaustion at increasing depths, but certainly all previous experience goes far to negative this supposition, and, looking at the very favourable results which have been won at 500 feet, there is no substantial reason why the veins should not prove equally productive at 5,000 feet, or at even a greater depth.

When, a few years back, little or no knowledge had been obtained in connection with reefing, and operations were greatly impeded by the absence of suitable machinery, the properties of quartz veins were comparatively a *terra incognita* to the gold miner, the theory of exhaustion below a certain depth* being then generally entertained; in fact, there are numerous instances on record, to go no further back than 1857, where rich and palpably gold-bearing lodes were thrown up as being "worked out." But the labours of the present day strongly refutes the doctrine of the poverty of the lower strata, and it must be admitted that to those interested in the solution of the question recent disclosures offer every encouragement to deep mining.

It may be mentioned that 100 tons of stone, taken at a depth of 550 feet from one of the earliest wrought shafts in the colony, lately produced 543 ounces of gold, or at the rate of 5½ ounces to the ton. At Tarnagulla, at a depth of 450 feet, the main reef it is yielding five ounces to the ton; at Bendigo, at 500 feet, is yielding four ounces to the ton; and at 400 feet auriferous stone has been obtained from Poverty Reef which produced as much as 40 ounces to the ton. At the Albion Company's ground at Steiglitz, the yield has steadily increased from four ounces to the ton at 200 feet, to seven ounces to the ton at 400 feet, "the stone in the bottom of the level now being worked appearing richer than any hitherto crushed." This testimony could be supplemented by statistics from other districts, including the working company at the Clunes, at Adelong, Inglewood, and the St. John del Rey Company, Brazil, all contributing to show that the exhaustion of our gold mines is a contingency too remote for present speculation.

(*To be continued.*)

* The water level.

Manufactures.

Flax and Rape.—The growing crops of flax are well spoken of both in this country and in Holland. The report as to the growing rape crop still continues unfavourable.

Iron, Machine, and Engineer Tool Trades.—Nearly all the iron works in the neighbourhood of Leeds continue to be closed, with no immediate prospect of a settlement of the dispute between the master and the men. The new machines for puddling iron are engaging much attention, those now in work being well spoken of. The machine makers continue to be very busy, as do also the makers of engineers' tools. The turn-out in the iron trade has not hitherto affected these trades, nor is it probable that it will do so to any material extent, at all events not immediately. Makers of locomotives and railway plants are full of work.

Commerce.

New Telegraph Register.—In most telegraph registers the style or steel pen is so attached to the pen lever as to be immoveable laterally; and in order to write upon the paper in as many lines as practicable, the paper has to be moved laterally, and the working surface of the rollers has to be of a length almost equal to twice the width of the paper. As one of the rollers is pressed upon the paper by means of springs bearing on each end of the roller, every time the paper is moved laterally these springs have to be re-adjusted, else the pressure of the roller will be greater on one end of the paper than on the other, causing it to run untrue in its passage between the rollers. Mr. Robert Henning, of Ottawa, has invented an arrangement, the main object of which is to obviate the necessity of moving the paper laterally, and thereby obviate the above difficulty; and it consists in the arrangement of the style or pen in a holder, which is moveable in a direction parallel with the length of the rollers, by which means also the machine is enabled to be made much narrower, requiring less pinion wire for its construction, and the clock train is made to run more truly by reason of the axles being shorter. This moveable pen necessitates the provision of several grooves in the roller against which the pen operates, instead of only one groove, as in the rollers of the registers heretofore constructed, the said grooves corresponding in number and in distance apart with the lines of writing desired to be made on the paper; and the invention further consists in a certain mode of combining the moveable pen-holder with the pen-lever, and adjusting it relatively with the several grooves of the roller, whereby the pen is enabled to be brought exactly opposite to the grooves, and the lines of writing on the paper are always made at equal distances apart, so that a greater number of lines are enabled to be made upon the paper, and the paper thereby economised.

Wine.—London is, undoubtedly, the great centre of the wine trade, for in London at least two-thirds of the wine consumed in the kingdom is cleared from the Custom-house. From the Customs lists, and returns for 1863, it appears there were, in 1863, 2,636 different houses in London paying duty on their own wine, and the quantity cleared by them was 6,267,591 gallons. But of this number there were only 76 houses who paid

on more than 20,000 gallons each, the total quantity paid by them being 3,497,186 gallons, or on the average 46,015 gallons each. There were 369 houses who paid on quantities over 2,000 gallons and under 20,000, the total paid by them being 2,296,972 gallons, or on the average 6,224 gallons to each. The houses who paid on less than 2,000 gallons were 2191 in number, and the total quantity cleared by them was 473,433 gallons, or on the average only 216 gallons to each house.

Colonies.

Salmon in Tasmania.—The salmon ova sent from this country by the Norfolk have arrived safely at Melbourne, and have been transmitted to Tasmania, where they are showing signs of life in the breeding ponds of the river Plenty.

Ostrich Farming.—At the Swellendam Agricultural Show, (Cape of Good Hope), Mr. van Dyk said that he had many ostriches running on his place; he had formerly got £1 for them each year, but now he got from £10 to £15 sterling. He considered that every tame ostrich was worth £20 sterling a year.

New Zealand.—The quantity of provisions and supplies of all kinds sent from Auckland for the army is so great that the necessaries of life have become exceedingly dear, while the increase of population augments the rents of every tenement. Pleuro-pneumonia is said to have made its appearance among the cattle, and bids fair to put a stop to their importation, and this will of course greatly increase the price of one of the staples of food. It having been resolved that the land of all the natives who have taken up arms against the local government, as well as those who have adhered to and assisted such persons, shall be confiscated and sold to pay the expenses of the war, it became necessary to import purchasers for this land and to provide for its being occupied by Europeans. This is the central idea of the general government scheme of immigration, for carrying it into operation, and the sum of £300,000 was voted. Auckland's share of that vote is £150,000; a part of this has already been expended, and the colonial treasurer, it is understood, has been authorised to expend the remainder by forwarding emigrants from England. Taking the average cost of passage as something less than £10 per head, 20,000 persons may thus be added within a year to the population of the colony, an addition equal to two-thirds of its present amount. The kind of population usually brought to a colony by public funds is a pauper population without capital, and the consequence of this large immigration seems likely still further to increase the price of food. The competition they produce must also reduce the wages of labour, and tradesmen and labourers who are already settled in Auckland seem likely to suffer. Some of them will, no doubt, be sent to the Waikato, where they are to be located, and can be employed upon the public works, for which £900,000 has been voted; but still these must be fed, and the war is now making a desert of that district.

Navigation of the Waikato.—The war in New Zealand is beginning to excite boat-building on the Waikato, but the attempt to navigate it will be a task of no small difficulty, as it is a new river to ascend, whose bottom is in many parts a complete *chevaux-de-frise* of snags. This river being the only outlet for the drainage of a large tract of country, is subjected to great changes in the volumes of water that rolls along its channel. A continuance of wet weather raises, by many feet, the level of the river, and thus enables the navigator to pass safely over dangers which a few weeks of drought will again place in his track. Again, the rapid current is a great ingredient of danger, combined, as it often is, with great sinuosity. Where the current runs rapidly in the middle, still water, or even an upward current, will be met with at the sides. It is, therefore, very difficult to make a boat ascending the river answer her helm. When a boat has to round a sudden bend of the river, it will generally happen that her head or her stern is in the still water, or even the eddy at the sides, while the other part of her is exposed to the full force of the stream. Hence the rudder loses much of its effectiveness. In order to facilitate the passing of sharp turns in steamboats, a small paddle-wheel is placed transversely, at the bow of the boat. This paddle-wheel is connected with the engine by gearing, so that it can be worked either one way or the other, or not worked at all, as the case may require. A few turns of this wheel will change the direction of the boat's head, though her rudder may be quite powerless, and she is thus prevented from being at the mercy of the current. When this wheel is not in action, the blades lying parallel to the direction of the boat oppose little resistance to the action of the water. This steering apparatus is not intended to supersede the rudder for ordinary purposes, but only to be used when sharper turns than usual make some more effective means of steering requisite.

Publications Issued.

A Description of certain Instantaneous Dry Collodion Processes, by Thomas Sutton, B.A. (*Sampson Low*). The object of the treatise is to show how a good dry plate may be prepared as sensitive as a wet one, preserving its good qualities on a tour for several weeks. The author gives minute directions for the preparation of the dry plates by what is commonly known as the tannin process of Major Russell, pointing out the special practical points in it necessary to be attended to, and how to remedy failures when they occur. He also describes several methods of manipulating what are known as the Fothergill and Gum processes.

Notes.

National Gallery.—The House of Commons, on Monday evening, refused to sanction the proposition for the removal of the National Gallery to Burlington House by a majority of 52 against the Government.

National Gallery, Dublin.—By a parliamentary return just issued it appears that the total cost of the National Gallery, Dublin, up to the present time, including all charges, is £26,738 19s. 8d. The gallery was opened to the public on the 1st of February, but the interior of that portion of the building originally intended to contain Archbishop Marsh's library requires to be completed so far as regards the plastering, staircase, and bookstalls, for which no estimate can be made until it has been decided to what purpose this part of the building shall be applied. The plans, specifications, &c., required for all works connected with the gallery and library, were prepared at South Kensington by Captain Fowke, in accordance with instructions from the Department of Science and Art, and no payments have been made by the building trustees for the services so performed by him. The cost incurred by draughtsmen, and paid to the secretary of the department, amounted to £520.

Granite for the Thames Embankment.—The contracts for the undertaking are in the course of being let. The stone to be principally employed is granite, and the contract for the supply of granite for the first section has been secured, under the government contractor, Mr. Furness, by the lessees of the granite quarries of Kirkconnell and of Old Lands, on the Urr, belonging respectively to Mr. Whitam, of Kirkconnell, and Mr. Maxwell, of Munches. The first section of the embankment extends from Westminster to Waterloo-bridge, and the quantity of stone will be very great.

Agricultural Statistics.—The House of Commons, on Tuesday, passed a resolution affirming Mr. Caird's motion, "That, in the opinion of this House, the collection and early publication of the Agricultural Statistics of Great Britain would be advantageous."

Cow's Milk.—Dr. Vercheyen, of the State Veterinary School in Belgium, has been experimenting with reference to the effects of extirpating the horns of cows whilst young. The results of the experiments made on cows of the same age, breed, and under the same conditions, some of which have been thus operated upon and some not, are very curious. It appears that the average daily yield of milk from an ordinary Dutch cow is fifteen litres, whilst four cows deprived of their horns furnished from eighteen to nineteen litres. In the pastures in which they fed, the "Equisetum" was abundant. One kept the following year gave, fourteen days after calving, 24½ litres. The milk of five cows not deprived of their horns, and feeding in the same pasturage, was far from reaching the same quantity. A comparative experiment with an animal deprived of its horns, and two not so deprived, placed under precisely the same conditions, and continued for three years, showed that the first animal gave from two to three litres daily more than either of the other two. If we calculate that the period during which a cow produces milk annually is thirty-four weeks, or 238 days, and take the excess of produce in round numbers to be two litres daily, we get an annual total of 476 litres in addition to the ordinary yield, and the milk is further stated to be richer in caseine and cream, containing from 17 to 20 per cent.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...R. Geographical, 8½. 1. Letters from Dr. Livingstone to Sir Roderick I. Murchison and the late Admiral Washington. 2. Extract of a Letter from Dr. Baikie, from Lukoia, on the Niger. 3. Mr. W. D. Cooley, "Travels of Portuguese in Inner Africa, between Mozambique and Benguela."
British Architects, 8.
Tues. ...Medical and Chirurgical, 8½.
Zoological, 9.
Syro-Egyptian, 7½. Mr. Thomas Lewin, "On the Site of the Temple at Jerusalem."
Anthropological, 8.
Wed. . Meteorological, 7. Annual Meeting.
Thur. ...Zoological, 4.
Royal, 8½.
Antiquaries, 8.
Linnæan, 8.
Chemical, 8. 1. Dr. Schorlemmer, "On the Identity of Methyl and Hydride of Ethyl." 2. Dr. Sprengel, "On Vacuum Experiments."
Numismatic, 7. Annual Meeting.
R. Society Club, 6.
Fri. ......Philological, 8.

Patents.

From Commissioners of Patents Journal, June 3rd.

Grants of Provisional Protection.

Anchors—1154—F. Martin.
Aniline dye colours—1199—O. Sachs.
Animal charcoal, process of revivification of—1228—A. Fryer.
Billiard tables, metallic and slate—1044—D. Harris.
Breakwaters, &c.—1220—C. Liddell.
Carriages and weights, apparatus for raising—1266—W. Dray.
Carriages propelled by the human body—1213—A. Goodrich.
Coal gas, purification of—1200—J. Phillips.
Colouring matters—1252—R. Smith.
Cops, machines for winding—1264—J. Combe and J. H. Smalpage.
Cotton fibre, separation of, from the seed—1274—E. A. Cowper.
Cotton, machinery for ginning—1248—W. Wanklyn.
Cotton, machinery for spinning—1047—W. Taylor.
Drilling machinery, portable—1216—G. Haseltine.
Electric telegraph posts—1242—J. Hamilton, jun.
Electric telegraph wires, testing the insulation of—1234—W. Reid.
Engines and boilers, locomotive—1210—R. F. Fairlie.
Fabrics, paper, &c., tentering, stretching, &c.—1204—J. L. Norton.
Fabrics, water and oil proof—1218—D. Bateman.
Fibrous substances, manufacture of paper from—1232—J. Womersley.
Files, machinery for cutting—1290—G. T. Bousfield.
Fire grates—1212—A. Gall.
Fluids, injecting and ejecting—1151—A. Barclay.
Fuel—949—J. Milnes.
Guns, breech-loading—715—H. E. Hutchins.
Harmoniums—1276—E. Hodges.
Horse hoes and seed drills—1268—W. Sargeant.
Hydraulic presses, &c.—1198—R. Wilson.
Lever wrench—1256—W. Adkins.
Looms—1272—E. Wilson.
Marble, stone, &c., apparatus for cutting—1244—G. Hunter.
Metallic alloys—1262—T. Dunlevie and J. Jones.
Metal, machinery for punching—1226—F. Blackwell.
Money till, self-acting—1230—R. Jones.
Motive power—1206—M. P. W. Boulton.
Name plate, &c., for doors—1202—S. Robinson.
Nuts, manufacture of—1089—O. C. Burdict.
Ordnance and projectiles—1250—P. M. Parsons.
Paving—1260—G. Fagg.
Printing or stamping, presses for—1284—W. G. and J. H. Todman.
Projectiles—1108—A. V. Newton.
Railway trains, communication between the guards and engine drivers of—1223—E. W. Furrell.
Reaping and mowing machines—1240—J. Fletcher.
Sails, reefing and furling—1246—S. Foster and W. Rowden.
Ships, cleaning the bottoms of—1208—R. D. Dwyer.
Ships, propulsion of—1222—R. Griffiths.
Sleeve links, solitaires, &c., fastenings for—1282—J. O. Winkles.
Steam hammers, arrangements applicable to—1183—D. Butler.
Varnishes, &c., oil and spirit—1270—J., E. G., and C. H. Freeman.
Venetian blinds—1097—D. Clarke.
Vessels for containing poisons—1254—J. B. Merrikin.
Volatile oils, generating gas from—1236—W. Wilson.
Woven fabrics, cleaning, bleaching, and dyeing—1205—T. N. Kirkham and V. F. Ensom.
Yarn and thread, twisting and doubling—1224—B. Gyte and M. Walsh.
Zinc, manufacture of—1258—J. Webster.

Inventions with Complete Specifications Filed.

Gullies, stench trapped—1314—D. Clark.
Swivels, manufacture of—1331—H. A. Bonneville.

Patents Sealed.

2789. G. Yates.	3109. M. Hillary.
3065. A. J. Aspinall.	3116. G. T. Bousfield.
3067. A. Antill & W. Wilkinson.	3126. T. Webb.
3082. H. B. James.	3144. R. Saunders.
3087. T. A. Blakely.	3146. W. T. W. Jones.
3088. T. A. Blakely.	3148. P. Ward.
3089. P. H. Desvignes.	3190. W. Clarke.
3090. R. Harrowby, J. Foulds, and A. Harrowby.	3196. R. Saunders.
	404. F. Testuz.

From Commissioners of Patents Journal, June 7th.

Patents Sealed.

3102. T. H. Fletcher & R. Forrest.	3137. J. Townsend.
3107. T. V. Morgan.	3145. J. Platt & W. Richardson.
3112. M. Friedlander.	3147. G. T. Bousfield.
3117. R. W. Pyne.	3149. G. T. Bousfield.
3120. J. Bullough.	3155. S. and T. Smith.
3124. A. Epps.	3167. J. H. Johnson.
3125. E. Shepherd.	3170. C. J. Robinson.
3128. N. Walton.	3173. J. M. Worrall.
3129. J. Cliff.	3199. H. Clayton.
3133. R. A. Brooman.	3302. G. Phillips.
3136. T. Clayton.	803. H. H. Mills.

Patents on which the Stamp Duty of £50 has been Paid.

1445. H. de Simencourt and J. K. Blackwell.	1415. F. J. Manceaux.
1643. W. McNaught.	1430. S. Hawkins.
1386. H. N. Penrice.	1470. J. Whitehead.
1387. W. R. Jeune.	1418. D. Nickols.
1432. W. O. Johnston.	1421. L. J. P. de Mirimonde.
1469. W. Clark.	1437. J. Platt & W. Richardson.
1400. W. R. Floyd.	1439. J. Platt & W. Richardson.
1409. J. A. Williams.	1448. A. A. Croll.
	1518. J. Knowles.

Patents on which the Stamp Duty of £100 has been paid.

1540. W. H. Walenn.	1587. W. E. Newton.
1579. R. Roberts, and W. and S. Shaw.	1598. A. F. Sherman.

Registered Designs.

Rifle light elevator and regulator—4636—May 20—Theophilus Murcott, 68, Haymarket, S.W.
Framing of a printing machine—4637—May 25—Wm. Conisbee, Herbert's-buildings, Waterloo-road.
Waiscoat pocket vesta box—4638—June 4—R. Letchford and Co., Three Colts-lane, Bethnal-green, E.C.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, JUNE 17, 1864. [No. 604. Vol. XII.

Announcements by the Council.

Presentation of Medals and Prizes.

His Royal Highness the Prince of Wales, K.G., President of the Society, has been pleased to appoint Friday, the 24th of June, at three o'clock, to present the medals and prizes awarded during the present Session. The Presentation will take place at Willis's Rooms, King-street, St. James's. Members will be admitted by ticket only, for which application should be made to the Secretary; each ticket to admit the member and one lady. The doors will be open at 2 o'clock.

EXAMINATION, 1864.

PRIZES AND CERTIFICATES AWARDED TO CANDIDATES.

PRIZES.

His Royal Highness the Prince Consort's Prize of Twenty-five Guineas, to

274—John Allan, 25, of the Glasgow Athenæum, assistant surveyor, who obtained the following First-class Certificates:—

1861. Logic—First-class Certificate, with First Prize.
1862. English History—First-class Certificate, with First Prize.
,, English Literature—First-class Certificate, with Second Prize.
1863. Arithmetic—First-class Certificate, with First Prize.
,, Book-keeping—First-class Certificate, with First Prize.
,, Geography—First-class Certificate, with Second Prize.
1864. Magnetism, Electricity, and Heat—First-class Certificate, with Second Prize.
,, Domestic Economy—First-class Certificate, with First Prize.
,, Animal Physiology—First class Certificate, with Second Prize.

Arithmetic	1st Prize	£5	To No. 1119—Samuel Drew, jun., 19, Walsall Working Men's College, butcher and cattle dealer
	2nd Prize	3	,, 186—William Wilkins, 17, Chatham, Rochester, Strood, and Brompton Institution, clerk
Book-keeping	1st Prize	5	,, 280—James Dougall Borthwick, 19, Glasgow Athenæum, clerk
	2nd Prize	3	,, 400—Andrew McDowall Houstoun, 19, Glasgow Mechanics' Institution, accountant's clerk
Algebra	1st Prize	5	,, 548—Thomas Healey, 24, Burnley Mechanics' Institution, book-keeper
	2nd Prize	5	,, 903—John Thomas Wright, 19, Oldham Lyceum, clerk
Geometry	1st Prize	3	,, 739—William Meadows, 16, City of London College, picture-frame maker
	....	...	*No Second Prize awarded.**
Mensuration	1st Prize	5	,, 239—William James Fitze, 19, Devonport Mechanics' Institution, shipwright
	2nd Prize	3	,, 548—Thomas Healey, 24, Burnley Mechanics' Institution, book-keeper
Trigonometry		...	*No Prizes awarded.*†
Conic Sections	1st Prize	5	,, 239—William James Fitze, 19, Devonport Mechanics' Institution, shipwright
	....	...	*No Second Prize awarded.**

* No other Candidate obtained a First class Certificate in either of these subjects.
† No Candidate obtained a First-class Certificate in either of these subjects.

Navigation & Nautical Astronomy......	....	...		*No Prizes awarded.*†
Principles of Mechanics ...	....	...		*No Prizes awarded.*†
Practical Mechanics	1st Prize	5	,,	890—David Bruce, 18, Newcastle-on-Tyne Mechanics' Institution, engineer
	2nd Prize	3	,,	1123—Henry Logan, 23, Wakefield Mechanics' Institution, iron founder
Magnetism, Electricity, and Heat ...	1st Prize	5	,,	420—James Mitchell, 26, Popular Evening Classes, Andersonia-University, Glasgow, mason
	2nd Prize	3	,,	274—John Allan, 25, Glasgow Athenæum, assistant surveyor
Astronomy ...	1st Prize	5	,,	758—William Vaughan, 23, City of London College, clerk
	....	...		*No Second Prize awarded.**
Chemistry ...	1st Prize	5	,,	739—William Meadows, 16, City of London College, picture frame maker
	2nd Prize	3	,,	548—Thomas Healey, 24, Burnley Mechanics' Institution, book-keeper
Animal Physiology (in relation to health).......	1st Prize	5	,,	739—William Meadows, 16, City of London College, picture-frame maker
	2nd Prize	3	,,	274—John Allan, 25, Glasgow Athenæum, assistant surveyor
	3rd Prize‡	2	,,	364—James Keith Dempster, 26, Glasgow Mechanics' Institution, architectural draughtsman
	Two Prizes of Books, to the value of £1 each§	1	,,	806—William Henry Greenwood, 18, Manchester Mechanics' Institution
		1	,,	843—Robert Petty Martin, 16, Manchester Mechanics' Institution, chemist
Botany.........	1st Prize	£5	To No.	981—William Botting Hemsley, 20, Richmond Parochial Library, assistant in the herbarium, Kew
	....	...		*No Second Prize awarded.**
Agriculture ...	1st Prize	5	,,	726—John Hughes, 20, City of London College, chemical assistant
	....	...		*No Second Prize Awarded.**
Mining and Metallurgy¶	1st Prize	5	,,	448—William Williamson, 26, Popular Evening Classes, Andersonian University, Glasgow, coal miner.
	2nd Prize	3	,,	594—David Griffiths, 25, Leeds Mechanics' Institution, book-keeper
Political and Social Economy.........	....	...		*No Prizes Awarded.*†
Domestic Economy.........	1st Prize	5	,,	274—John Allan, 25, Glasgow Athenæum, assistant surveyor
	2nd Prize	3	,,	140—Swaine Wilkinson, 22, Bradford Mechanics' Institute, warehouseman
Geography ...	1st Prize	5	,,	974—Thomas Ivemey, 23, Pembroke Dock Mechanics' Institute, caulker
	2nd Prize	3	,,	744—Henry Thomas Pollard, 16, City of London College, clerk
English History	1st Prize	5	,,	584—William Todd, 18, Leeds Mechanics' Institute, woollen manufacturer
	2nd Prize	3	,,	677—Walter Slater, 23, London Mechanics' Institution, clerk
	3rd Prize ‖	2	,,	759—William Waters, 18, City of London College, clerk
	Three Prizes of Books, to the value of £1 each ‖	1	,,	248—Henry George White, 22, Devonport Mechanics' Institute, shipwright
		1	,,	489—Charles William Wright, 17, Hull Young People's Christian and Literary Institution, clerk
		1	,,	1158—George Cadley, 21, Manchester Mechanics' Institute, boot-closer
English Literature.........	1st Prize	5	,,	129—Joseph Harrison, 22, Bradford Mechanics' Institution, clerk
	2nd Prize	3	,,	286—Alexander Johnston, 19, Glasgow Athenæum, railway clerk
	3rd Prize..........	2	,,	359—Archibald Thomson, 27, Glasgow Mechanics' Institution, student
	Three Prizes of Books, to the value of £1 each ‖	1	,,	671—William Brosnahan, 28, London Mechanics' Institution, Inland Revenue officer
		1	,,	711—George William Garrett, 21, City of London College, commercial clerk
		1	,,	761—Henry James Sudell, 23, City of London College, clerk
Logic & Mental Science...	1st Prize	5	,,	677—Walter Slater, 23, London Mechanics' Institution, clerk
	2nd Prize	3	,,	671—William Brosnahan, 28, London Mechanics' Institution, Inland Revenue officer
Latin and Roman History	....	...		*No Prizes Awarded.***

* No other Candidate obtained a First-class Certificate in either of these subjects.
† No Candidate obtained a First-class Certificate in either of these subjects.
‡ Additional, by gift of Harry Chester, Esq.
§ The Third Prize of Books in this subject is not awarded, as the only other Candidate obtaining a First-class Certificate was disqualified from receiving a Prize.
‖ Additional, by gift of Sir C. Wentworth Dilke, Bart.
¶ The additional Prizes are not awarded, as no other Candidates obtained First class Certificates.
** The only Candidates who obtained First-class Certificates in this subject were disqualified from receiving prizes.

French	1st Prize	5	,,	730—James Neill Kelly, 23, City of London College, book-keeper
	2nd Prize	3	,,	306—James Wade, 27, Glasgow Athenæum, cashier
German	1st Prize	5	,,	832—Arthur Rigby, 18, Manchester Mechanics' Institution, engineer
	2nd Prize	3	,,	697—Henry William Bruton, 20, City of London College, banker's clerk
Free-hand Drawing	1st Prize	5	,,	1104—Henry Hill, 33, Messrs. Chance's Library, Smethwick, designer
	2nd Prize	3	,,	425—John Dingwall, 28, Popular Evening Classes, Andersonian University, Glasgow, ornamental draughtsman
Mechanical Drawing	1st Prize	5	,,	921—Thomas Edwards, 19, Oldham Science School, mechanic
	2nd Prize	3	,,	930—Thomas Wood, 30, Oldham Science School, clerk
Theory of Music	1st Prize	5	,,	641—James Cooksey Culwick, 18, Lichfield Institution, organist's apprentice
	2nd Prize	3	,,	1071—George Mansfield, 23, Wolverhampton Working Men's College, printer

CERTIFICATES.

The following is an Alphabetical List of the Candidates who have obtained Certificates:—

(1st) after a subject signifies a First-class Certificate.
(2d) ,, ,, Second-class ,,
(3d) ,, ,, Third-class ,,

(The occupations stated are either present or proposed.)

No.

838—Adams, Alfred, 18, Manchester M.I., warehouseman—Arith. (3d)

936—Ainsworth, William, 24, Oldham Science Sch., clerk—Geom. Dwg. (3d)

398—Aitken, John, 19, Glasgow M.I., clerk—Arith. (3d); Latin, &c. (3d)

772—Albin, Marie Juliette, 27, Royal Polytech. Inst. —French (1st)

78—Alderson, Emily, 26, Birmingham and Mid. Inst., daily governess—French (2d)

79—Alderson, Louisa, 28, Birmingham and Mid. Inst., daily governess—Eng. Lit. (3d)

416—Alexander, James, jun., 21, Pop. Evg. Classes, Andersonian Univ., Glasgow, clerk—Chem. (2d)

275—Alexander, William Murray, 24, Glasgow Ath., measurer—German (2d)

876—Allan, George, 23, Newcastle-on-Tyne M.I., engineer—Chem. (3d)

274—Allan, John, 25, Glasgow Ath., assistant-surveyor —Magnet. Elect., &c. (1st), with 2nd Prize; Domestic Econ. (1st), with 1st Prize; Animal Phys. (1st), with 2nd Prize, together with the *Prince Consort's Prize of Twenty-five Guineas.*

1057—Allcott, James H., 20, Southampton Ath., Custom's officer—Arith. (3d); Music (2d)

637—Allen, Walter Stott, 21, Leicester Ch. of Eng. Inst., banker's clerk—Bkpg. (1st)

933—Ambler, Edward, 29, Oldham Sci. Sch., machine joiner—Geom. Dwg. (2d)

618—Ambler, Samuel, 19, Leeds Young Men's Christian Assoc., warehouseman—Bkpg. (2d)

276—Anderson, David, jun., 17, Glasgow Ath., clerk—Bkpg. (2d)

370—Anderson, James, 26, Glasgow M.I., clerk—Mens. (3d)

80—Anderton, John G., 20, Birmingham and Midl. Inst., optician—Mag., Elect., &c. (2d)

910—Andrew, Herbert, 19, Oldham Sci. Sch., clerk—Geom. Dwg. (2d)

1086—Andrews, John S., 20, Stafford Road Works Inst., clerk—Arith. (1st); Geog. (1st); Eng. Hist. (3d)

483—Andrews, William D., 35, Hitchin M.I., plasterer and bricklayer—Free-hd. Dwg. (2d)

337—Angus, Ruthven D., 20, Glasgow Inst., teacher—Chem. (2d); Eng. Lit. (2d); Latin, &c. (2d)

1144—Appleyard, Isaac, 21, Middlesbro' M.I., clerk—Min. and Met. (2d); Chem. (2d); Geog. (2d)

223—Appleyard, Joseph T., 21, Derby Railway Lit. Inst., commercial clerk—Bkpg. (1st); French (1st)

1183—Archer, William, 17, St. Paul's Evg. Classes, Bow Common, solicitor's clerk (articled)—Arith. (1st); Alg. (1st); Bkpg. (2d); Latin, &c. (2d)

335—Archibald, Alex., 21, Glasgow Inst., house painter —Free-hd. Dwg. (1st)

804—Arensberg, Henry, 18, Manchester M.I., clerk—German (1st); French (3d)

36—Ashby, John Thomas, 17, Farnham Y.M.I., teacher—Arith. (2d); Free-hd. Dwg. (3d)

207—Ashton, Catherine, 17, pupil teacher—Geog. (2d)

1003—Ashton, Joseph, 18, Salford W.M.C., assistant salesman—Arith. (3d)

900—Ashton, Thomas, 22, Henshaw-street Mut. Imp. Soc., self-actor minder—Arith. (3d)

904—Ashton, William, 23, Henshaw-street Mut. Imp. Soc., mechanic—Dom. Econ. (2d)

578—Ashworth, Edwin, 26, Rawtenstall M.I., mule-spinner—Arith. (3d)

865—Ashworth, Henry, 19, Mossley M.I., piecer—Bookkeeping (2d)

81—Atkins, Alfred Hodgetts, 17, Birm. and Mid. Inst., pupil teacher—Geom. (3d)

199—Atkinson, John Ainscough, 21, Crewe M.I., post-messenger—Arith. (3d)

1002—Atkinson, John H., 18, Salford W.M.C., clerk—German (2d)

*97—Atlee, Thomas, 29, Birm. and Mid. Inst., commercial clerk—Bkpg. (1st)

259—Austin, Frederick, 16, Faversham I., clerk—Eng. Hist. (2d)

222—Aylott, Sarah, 29, teacher—Eng. Hist. (2d); Geography (3d)

1093—Bailey, David, 29, Bilston Inst., private schoolmaster—Arith. (2d); Algebra (3d)

247—Bailey, George, 22, Devonport M.I., shipwright—Eng. Hist. (3d)

901—Bailey, John Hyde, 16, Oldham Lyceum, banking clerk—Bkpg. (3d)

907—Bailey, Stanley, 17, Henshaw-street Mut. Imp. Soc., cotton piecer—Geom. Dwg. (3d)

224—Bailey, William Heap, 19, Derby M.I., warehouseman—Bkpg. (1st)

266—Baillie, Robert J., 17, Gilford Young Men's Mut. Imp. Assoc., teacher—Geog. (3d)

963—Bain, James, 27, Paisley Artiz. Inst., plumber—Music (3d)

352—Baird, John, 21, Glasgow Inst., warehouseman—Arith. (3d)

688—Bakewell, Armitage, 23, City of London College, clerk—Bkpg. (1st)

1055—Bance, Edward, 21, Southampton Ath., computer, Ordnance Survey office—Arith. (3d)
524—Bannister, James, 25, Nelson M.I., warehouseman—Arith., (3d)
499—Bardwell, Henry Bagley, 21, Ipswich W.M.C., millwright and pattern-maker—Arith. (3d)
141—Barker, Albert, 18, Bradford M.I., warehouseman Bkpg. (2d)
174—Barker, Charlotte S. M., 16—French (2d)
523—Barker, John, 21, Nelson M.I., weaver—Chem. (3d)
996—Barker, Wm. T., 17, Salford W.M.C., warehouseman—Arith. (3d)
1152—Barlow, Samuel, 20, Warrington M.I., book-keeper—Arith. (3d)
689—Barnett, Edwin A., 20, City of London College, accountant—Bkpg. (1st)
388—Barr, Wm. 19, Glasgow M.I., chemist—Arith. (1st)
47—Barr, Wm. H., 19, Bacup M.I., druggist's assistant Chemistry (3d)
591—Barrett, A. G., 17, Leeds M.I., clerk—Chem. (3d)
653—Barrow, James Henry, 16, Queen's Coll., Liverpool, pupil teacher—Arith. (3d); Geom. (3d)
1164—Bate, John, 23, Stourbridge M.I., bricklayer—Alg. (1st); Geom. (2d)
512—Batley, Henry Gurson, 19, Ipswich W.M.C., clerk—Eng. Hist. (2d)
1068—Battle, Hugh, 44, Wolverhampton W.M.C., missionary—Navig., &c. (2d); Prin. Mech. (2d)
837—Baxter, Dan. 24, shopman—Bkpg. (1st)
675—Beard, Elizabeth M., 40, London M.I., governess—German (2d)
673—Beard, Fanny, 34, London M.I., governess—German (1st)
690—Beaumont, Richard, 25, City of London Coll., engineer—Alg. (2d); Geom. (2d)
1098—Beck, Fanny, 20, Christ Ch. Sch., Oldbury, pupil teacher—Arith. (3d); Eng. Hist. (3d)
691—Beckingsale, George, 17, City of London Coll., clerk—Arith. (2d); Geog. (2d); Eng. Hist. (2d)
939—Beedham, John, 22, Oldham Sci. Sch., surveyor, &c.—Geom. Dwg. (2d)
692—Begent, George T., 18, City of London Coll., clerk (proposed)—Arith. (3d)
122—Berry, John Holker, 20, Farnworth M.I., spindle and flyer maker—Arith (3d)
867—Berry, Joseph, 32, Mossley M.I., warehouseman—Bkpg. (3d)
874—Best, John J., 18, Newcastle-on-Tyne Ch. Inst., clerk—Music (3d)
190—Bewers, William, 20, Chelmsford L. and M.I., merchant's clerk—Bkpg. (1st)
162—Beynon, Erasmus, 21, Bristol Mining Sch., chemist—Magnet. Elect., &c. (3d)
676—Bickle, John, 22, London M.I., smith—Arith. (1st)
464—Birkbeck, Sam, 22, Halifax W.M.C., warehouseman—Bkpg. (3d)
510—Bixby, Robert, 27, Ipswich W.M. Coll., engineer's clerk—German (2d)
350—Black, John, 18, Glasgow Inst., warehouseman—Arith. (1st)
279—Black, Malcolm, 16, Glasgow Ath.—Eng. Lit. (1st); Geom. (3d)
1134—Blanshard, William Noble, 19, York Inst. of Pop. Sci., attorney's clerk—Arith. (2d)
937—Bleasdale, John, 30, Oldham Sci. Sch., book-keeper—Geom. dwg. (2d)
517—Blezard, Alfred, 20, Padiham Trades' Hall Inst., Power-loom weaver—Chemistry (3d)
1087—Blizzard, Arthur W., 17, Wolverhampton W.M. Coll., tailor—Geog. (3d)
693—Blyth, Henry, 20, City of London Coll., clerk—Bkpg. (1st)
491—Bolton, Edward, 16, Hull Young People's Christ. and Lit. Inst., clerk—Arith. (1st); Eng. His. (3d)
469—Bolton, James, 17, Halifax W.M.C., clerk—Arith. (2d); Bkpg. (1st)
1097—Bonser, Elizabeth, 17, Christ Ch. School, Oldbury, pupil teacher—Arith. (2d); Eng. His. (2d)
16—Booth, William, 17, Aberdeen M.I., clerk—Arith. (2d); Bkpg. (1st)
278—Borland, Andrew, 22, Glasgow Ath., clerk and book-keeper—French (1st)
280—Borthwick, James Dougall, 19, Glasgow Ath., clerk—Bkpg. (1st), with 1st prize.
694—Bose, H. 17, City of Lond. Col. clerk—German (3d)
873—Bowden, Thomas, 20, Newcastle-on-Tyne Ch. of Eng. Inst., clerk—Arith. (3d)
638—Bowmar, Alfred Wm., 16, Leicester Ch. of Eng. Inst., banker's clerk—Arith. (2d)
376—Boyton, Thomas B., 16, Glasgow M.I., clerk or warehouseman—Bkpg. (2d)
902—Braddock, James, 17, Oldham Lyceum, warehouseman—Arith. (2d)
1175—Bramham, William, 19, St. Michael's Ev. Sch., Bromley, engineer and millwright—Arith. (3d)
1113—Brawn, James, 19, Willenhall Lit. Inst., clerk—Arith. (3d)
459—Brearley, Thos., 17, Halifax W.M.C., pupil teacher—Eng. Lit. (3d)
460—Brearley, William H., 18, Halifax W.M.C., book-keeper—Arith. (3d)
64—Brereton, Richard, 22, Banbridge Lit. and Mut. Imp. Soc., schoolmaster—Arith. (2nd); Eng. Hist. (3d); Alg. (3d)
695—Brewer, Arthur Richard, 19, City of London College, clerk—Arith. (1st); Bkpg. (1st)
501—Brewster, Richard G., 18, Ipswich W.M.C., pupil teacher—Eng. Hist. (2d); Geog. (3d)
590—Briggs, William, 19, Leeds Ch. Inst., clerk—Geog. (1st); Arith. (2d); Eng. Hist. (2d)
211—Bright, Henry, 29, St. John's School, Deptford, shipwright—Arith. (3d)
179—Bristow, William, 22, Canterbury Ch. of Eng. Lit. Inst., teacher—Latin, &c. (1st)
175—Britt, Frederick J., 23, Bristol Athenæum, watchmaker—French (3d)
82—Brockington, George S., 16, Birm. and Mid. Inst., paid monitor—Arith (1st); Latin, &c. (1st)
1124—Brooke, John O., 16, Wakefield M.I., plumber and gasfitter, &c.—Arith. (3d)
895—Brooks, Peter, 18, Oldham Lyceum, labourer—Arith. (3d.
850—Brooks, Richard H., 16, Manchester M.I., clerk—Bkpg. (2d)
671—Brosnahan, William, 28, Lond. M.I., Inland Revenue officer—Arith. (2d); Eng. Hist. (2d); Eng. Lit. (1st) with book prize; Logic (1st) with 2d prize.
1111—Brown, David, 23, Willenhall Lit. Inst., colliery clerk—Arith. (2d); Bkpg. (1st)
227—Brown, Charles G., 18, Devonport M.I., pupil teacher—Arith. (2d); Geog. (2d).
413—Brown, George, 18, Pop. Ev. Classes, Andersonian Univ., Glasgow, clerk—Arith. (3d); Bkpg. (2d)
655—Brown, Henry Fraser, 17, Liverpool Inst., clerk—Arith. (3d); Eng. Hist. (2d); Eng. Lit. (1st)
344—Brown, John, 19, Glasgow Inst., student—Arith. (3d)
422—Brown, John, 23, Pop. Ev. Classes, Andersonian Univ., Glasgow, building surveyor's clerk—Arith. (1st); Mens. (2d)
539—Brown, Robert, 21, Burnley M.I., weaver—Mag. Elect., &c. (2d); Anim. Phys. (2d)
187—Brown, William, 17, Chelmsford Lit. and M.I., coach-painter—Free-hd. Dwg. (1st)
411—Brown, William, 16, Pop. Ev. Classes, Andersonian Univ., Glasgow, pupil teacher—Arith. (1st)
802—Browning, William, 16, Manchester M.I., chemical student—Chem. (3d)
890—Bruce, David, 18, Newcastle-on-Tyne Ch. of Eng. Inst., engineer—Arith. (3d); Pract. Mech. (1st) with 1st prize; Prin. Mech. (3d)
697—Bruton, Henry W., 20, City of London College, banker's clerk—German (1st) with 2d prize.

339—Buchanan, Gavin, 17, Glasgow Inst., assistant registrar of births, &c.—Bkpg. (2d)
256—Buchanan, John, 20, Edinburgh Phil. Inst., clerk —Arith. (3d); Alg. (3d)
938—Buckley, Abner, 26, Oldham Sci. Sch., tin-plate worker—Geom. Dwg. (2d)
986—Buckley, Edwin, 17, Salford W.M.C., pupil teacher —Arith. (3d); Geog. (3d)
83—Budd, Frederick, 21, Birmingham and Midland Inst., tarpauling maker—Arith. (2d)
610—Bumby, Thomas, 17, Leeds Y.M.C.A., warehouseman—Bkpg. (2d)
1126—Bunn, John R., 33, Wakefield M.I., gardener—Agric. (3d)
1127—Bunn, William Durrant, 25, Wakefield M.I.—Navig., &c. (2d)
1051—Burge, Charles H., 17, Southampton Ath., Inland Revenue officer—Geog. (1st); Arith. (2d); Eng. Hist. (3d); Alg. (3d)
231—Burt, Henry, 16, Devonport M.I., engineer—Arith. (2d); Alg. (3d)
696—Burton, William, 20, City of London College, clerk—Arith. (2d); Bkpg. (1st)
215—Butler, Sarah Ann, 18, pupil teacher—Arith. (3d); Geog. (3d)
1118—Bytheway, George, 17, Walsall W.M. Coll., lawyer's clerk—Eng. Hist. (3d)

1158—Cadley, George, 21, Manchester M.I.—Eng. Hist. (1st) with book prize.
409—Camidge, Charles, 24, Pop. Ev. Classes, Anderson. Univ., Glasgow—Magnet Elect,, &c. (3d)
282—Campbell, Hugh, 19, Glasgow Ath., warehouseman —Arith. (2d)
238—Canter, William J., 19, Devonport M.I., engineer (student)—Alg. (1st); Mens. (2d)
603—Carr, James W., 17, Leeds M.I.—Arith. (2d); Eng. Hist. (3d); Alg. (3d)
589—Carr, Joseph Asher, 31, Leeds Ch. Inst., railway clerk—Bkpg. (2d)
281—Carrick, George, 25, Glasgow Ath., warehouseman —French (2d)
660—Carroll, Alfred, 17, Queen's College, Liverpool, engineer (apprentice)—Alg. (2d); Mens. (3d)
587—Carter, William, 24, Leeds Ch. Inst., railway clerk—Bkpg. (2d)
698—Carter, William, 22, City of London College, clerk—Bkpg. (2d)
699—Carter, William D. C., 18, City of London College, clerk—Arith. (3d); Bkpg. (2d); French (3d)
1116—Casson, Thomas, 20, Brierley Hill W.M.C., fitter —Arith. (2d); Mens. (3d)
173—Cavendish, Alexander Carnegie, 18, Bristol Ath., railway clerk—Arith. (3d)
923—Chadwick, John, 19, Oldham Sc. Sch., clerk—Geom. Dwg. (2d).
270—Chambers, William, 22, Gilford Y.M. Mut. Imp. Assoc., teacher—Arith. (2d)
210—Chambers, William S., 22, St. John's Sch., Deptford, marine engineer—Arith. (3d)
684—Champion, William, 19, St. Stephen's Evg. Sch., merchant's clerk—Bkpg. (2d)
1161—Chandler, Frederic, 17, Hertford L. and S.I., teacher—Arith. (2d); Bkpg. (2d).
784—Chantry, Lucy, 18, Macclesfield Use. Know. Soc.—Dom. Econ. (3d).
700—Chapman, James A., 23, City of London College, clerk—Prac. Mech. (3d)
1148—Charlton, Thomas, 19, Middlesbro' M.I., farmer—Agric. (2d); Chem. (3d)
701—Childs, Francis W., 26, City of London College, clerk—Bkpg. (1st)
377—Chirrey, David, 16, Glasgow M.I., clerk—Arith. (2d)
329—Clark, George, Junr., 21, Glasgow Inst., clerk—Latin, &c. (3d).
417—Clark, John, 20, Pop. Ev. Classes, Andersonian Univ., Glasgow, chemist—German (2); French (2d); Chem. (3d)
221—Clark, Robert, 16, shipwright—Geom. (3)
702—Clarke, George, 21, City of London Col., clerk—Arith. (2); Bkpg. (1st)
1171—Clarke, Robert Scott, 18, St. Mich. Evg. Sch., Bromley, storekeeper's clerk—Arith. (2d)
827—Clarkson, John, 19, Manchester M.I., joiner—Geom. Dwg. (3d)
851—Clayton, Joseph, 26, Hulme Christ. Ch. Inst., coachbody maker—Arith. (2d)
821—Clayton, William H., 19, Hulme Christ. Ch. Inst., warehouseman—French (3d)
554—Clegg, James, 20, Burnley Ch. of Eng. Lit. Inst., spinner—Chem. (3d); Geog. (2d)
522—Clegg, Samuel, 20, Nelson M.I., power-loom weaver—Chem. (3d)
1062—Clement, William G., 16, Southampton Ath.—Arith. (1st); Eng. Hist. (3d)
1146—Clemitson, William, 22, Middlesbro' M.I., engineer —Chem. (3d)
458—Clough, Robert, 23, Halifax W.M.C., assistant teacher—Eng. Lit. (3d)
149—Clough, William H., 18, Bradford M.I., grocer's assistant—Arith. (1st); Geog. (2d); Alg. (3d)
468—Coates, Joseph, 18, Halifax W.M.C., joiner (apprentice)—Bkpg. (3d)
1157—Cochrane, Peter, 18, Manchester M.I., warehouseman—Bkpg. (3d)
1156—Cochrane, William, 19, Manchester M.I., cabinet-maker—Arith. (2d); Eng. Hist. (3d)
1195—Cocks, John, 23, Hatherlow M.I. Soc., clerk—Arith. (2d)
160—Collens, Edward, 21, Bristol Trade Sch., laboratory assistant—Anim. Phys. (2d)
805—Collier, Alfred, 23, Hulme Christ. Ch. Inst., book-keeper—Arith. (3d)
788—Collins, Albert, 19, Macclesfield M.I., clerk—French (3d)
605—Cooper, Isabella M., 23, Leeds M.I.—German (2d)
1145—Cooper, Thomas Dawson, 19, Middlesbro' M.I., surveyor—Free-hd. Dwg. (2d)
168—Cosslett, Richard, 21, Bristol Y.M.C.A., carpenter Arith. (3)
703—Cowell, Matthew H., 25, City of London College, clerk—Bkpg. (1st)
635—Cowling, Samuel, 17, Leicester Ch. of Eng. Inst., accountant's clerk—Arith. (1st)
567—Cowpe, James, 23, Haslingden Inst., weaver—Chem. (3d)
549—Crabtree, Thompson, 16, Burnley M.I., warehouseman—Chem. (2d)
229—Crocker, George, 17, Devonport M.I., shipwright —Arith. (1st); Algebra (3d)
1028—Crosland, William, 27, Selby M.I., auctioneer—Bpkg. (2d)
545—Crossley, Jonas, 17, Burnley M.I., weaver—Arith. (3d); Bkpg. (3d)
1125—Crossley, Newman, 16, Wakefield M.I., clerk—Bkpg. (3d)
1056—Cudlipp, William, 21, Southampton Ath., clerk—Arith. (2d)
641—Culwick, James Cooksey, 18, Lichfield Inst., organist's appren.—Music (1st), with 1st prize
992—Cunliffe, James, 33, Salford W.M.C., dyer—Chem. (3d)

617—Dalby, Samuel, 16, Leeds Young Men's Christ. Assoc., draper—Arith. (3d); Geog. (2d)
624—Dalton, Edward, 20, Leeds Young Men's Christ. Assoc., hosier's assistant—Bkpg. (1st)
254—Dalziel, John, 22, Edinburgh Philo. Inst.—Chem. (2d)
283—Dansken, John, 28, Glasgow Ath., measurer—English Lit. (2d)

647—Davenport, James, 24, Lichfield Working Men's Assoc., grocer—Arith. (3d); Bkpg. (1st)
976—David, Peter G., 16, Pembroke Dock M.I., pupil teacher—Arith. (3d)
863—Davies, James H., 20, Manchester M.I., mechanic Geom. Dwg. (2d); Free-hd. Dwg. (3d)
800—Davies, Joseph, 20, Bollington Useful Knowledge Society, cotton piecer—Chem. (3d)
679—Davies, Thomas, 20, St. Stephen's Evng. School, government clerk—Eng. Hist. (3d); Geog. (2d)
166—Davies, Thomas W., 21, Bristol Diocesan Trade Sch., accountant—Arith. (1st); Eng. Hist.)2d)
995—Davies, William, 16, Salford W.M.C., clerk—Arith. (3d)
209—Davis, Henry Tadwell, 18, Greenwich Lit. Inst., engineer—Arith. (3d)
916—Davis, Samuel, 21, Oldham Sci. Sch., tin-plate worker—Geom. Dwg. (3d)
1052—Davis, Samuel J., 17, Southampton Ath., clerk—Arith. (1st); Geog. (1st); Eng. Hist. (3d)
893—Dawson, Herbert Townley, 19, Lees Lit. and Sci. Inst., teacher—Free-hd. Dwg. (3d)
872—Dawson, Wm., 20, Newcastle-on-Tyne Ch. of Eng. Inst., clerk—Arith. (3d); Geog. (3d)
1090—Dean, Wm., 24, Wolverhampton W.M. Col., railway clerk—Geom. (3d)
1008—Deane, John, 26, Salford W.M.C., cashier—Bkpg. (2d); French (3d)
364—Dempster, James K., 26, Glasgow M.I., architec. draughtsman—Anim. Phys. (1st), with 3d prize
153—Dewhirst, Richard, 19, Bradford M.I., warehouseman—Geog. (3d)
704—Dickinson, George, 19, City of London College, chemist's assistant—Bkpg. (2d)
428—Dingwall, Jas. Lockhead, 25, Pop. Evng. Classes, Andersonian Univ., Glasgow, clerk—Bkpg. (3d)
425—Dingwall, John, 28, Pop. Evng. Classes, Andersonian Univ., Glasgow, ornamental draughtsman—Free-hd. Dwg. (1st); with 2nd prize.
453—Dobson, Charles, 17, Haley Hill W.M.C., railway clerk—Bkpg. (2d)
542—Dodgson, William, 18, Burnley M.I., engineer—Chem. (3d); Mensur. (3d)
1040—Dorrell, Henry B., 17, Slough M.I., carpenter and joiner—Geom. Dwg. (2d); Free-hd. Dwg. (3d)
265—Douds, John, 26, teacher Nat. School—Arith. (3d)
390—Douglas, John Campbell, 16, Glasgow M.I., pupil teacher—Arith. (3d); Geog. (2d)
503—Dowsing, William, 20, Ipswich W.M.C., carpenter—Bkpg. (1st)
1119—Drew, Samuel, jun., 19, Walsall W.M. Coll., butcher and cattle-dealer—Arith (1st) with 1st prize; Alg. (3d)
502—Driver, Robert, 17, Ipswich W.M.C., pupil teacher—Bkpg. (2d)
911—Dronsfield, Joseph Standring, 22, Oldham Sc. Sch., stricklemaker—Geom. Dwg. (2d)
*121—Duckworth, Walter, 17, Farnworth M.I., railway goods clerk—Arith. (2d)
1103—Duffell, John, 17, Messrs. Chance's Lib., clerk—Arith. (2d)
794—Dugard, Frederic, 20, Macclesfield M.I., certif. schoolmaster—Music (1st)
340—Dunlop, William, 17, Glasgow Inst., bookseller's apprentice—Bkpg. (2d)
356—Duthie, George, 20, Glasgow Inst., insurance clerk—Arith. (3d); Bkpg. (2d)
347—Eadie, Donald, 17, Glasgow Inst., clerk—Bkpg. (2d)
905—Eckersley, Henry, 21, Henshaw-street Mut. Imp. Soc., warehouseman—Dom. Econ. (2d)
650—Edgar, James, 21, Liverpool Inst., post-office clerk—Bkpg. (2)
706—Edmonds, John, 19, City of London College, clerk—Eng. Hist. (1st); French (3d)
767—Edwards, Edwin, 17, Royal Polytech. Inst., clerk—Bkpg. (2)
*761—Edwards, Robert, 22, City of London College, stationer's assistant—Bkpg. (2d)
921—Edwards, Thomas, 19, Oldham Sc. Sch., mechanic—Geom. Dwg. (1st) with 1st prize.
972—Edwards Thomas, 16, Pembroke Dock M.I.—Arith. (1st); Alg. (2d)
975—Edwards Thomas, 19, Pembroke Dock M.I., shipwright—Arith. (1st)
977—Edwards, Wm., 18, Petersboro' M.I., pupil teacher—Eng. Hist. (3d); Geog. (2d)
387—Elder, James, 20, Glasgow, M.I., civil engineer—Principles of Mechanics (3d)
1038—Elliman, Samuel F., 16, Slough M.I., chemist [proposed]—Geom. Dwg. (3d)
835—Elliott, Thomas Griffin, 16, Manchester M.I.,——Arith. (2d); Chem. (3d)
244—Ellis, Charles Jones, 24, Devonport M.I., shipwright—Bkpg. (1st); Geog. (2d)
242—Ellis, Richard J., 19, Devonport M.I., shipwright apprentice—Bkpg. (3d); Mensur. (2d)
781—Elsom, Albert, 17, Louth M.I., pupil teacher—Arith. (2d)
216—Elworthy, Alfred, 18, pupil teacher—Arith. (3d)
625—Embleton, Charles, 18, Leeds Y.M. Christ. Assoc., engineer apprentice—Geom. (2d); Alg. (3d)
84—Embrey, George, 23, Birming. and Midland Inst., electro-plater—Chem. (2d)
774—Evans, George, 25, R. Poly. Inst., butcher—Arith. (3d); Dom. Economy (2d)
250—Evans, John Luther, 19, Devonport M.I., shipwright—Free-hd. Dwg. (3d)
1107—Evans, Thomas, 19, Messrs. Chance's Evg. Sch., Oldbury, clerk—Arith. (2d)

25—Falconer, William, 16, Aberdeen M.I., draper—Arith. (2d)
686—Fancourt, George, 19, St. Stephen's Evg. Sch., barrister's clerk—Arith. (1st)
217—Farncomb, Edward, 34, artist—Geog. (3d)
917—Faulkner, James, 18, Oldham Sc. Sch., stoker—Geom. Dwg. (3d)
707—Faulkner, Richard, 21, City of London Coll., bank clerk—Arith. (3d); Music (3d)
142—Fearnside, Henry, 18, Bradford M.I., clerk—Arith. (3d)
1064—Fellows, James, 22, Wolverhampton Young Men's Christian Inst., clerk—German (3d)
386—Ferguson, James, 19, Glasgow M.I., custom's clerk (proposed)—Arith. (1st); Eng. Hist. (2d); Geog. (2d); Algebra (3d)
145—Fielding, John, 16, Bradford M.I., clerk—Arith. (2d); Eng. Hist. (3d); French (3d); Geog. (3d)
880—Fields, Robert Le Hair, 29, Newcastle-on-Tyne M.I., clerk—Chem. (3d)
708—Fillan, Thomas T., 18, City of London Coll. clerk—Algebra (2d); Geom. (2d)
131—Firth, James, 18, Bradford M.I., cotton piecer—Arith. (3d); Bkpg. (2d)
709—Firth, James, 31, City of London Coll., clerk—Eng. Hist. (2d); Geog. (2d)
710—Firth, John W., 16, City of London Coll., clerk—German (2d); French (2d)
239—Fitze, William James, 19, Devonport M.I., shipwright—Conic Sections (1st), with 1st Prize; Mens. (1st) with 1st Prize; Trigonometry (3d)
500—Fitzpatrick, William, 16, Ipswich W.M.C., clerk—Arith. (3d)
583—Flockton, William, 28, Leeds M.I., insurance clerk—Eng. Lit. (1st)
798—Fogg, Roger, 17, Bollington Useful Knowledge Soc., pupil teacher—Arith. (1st); Geog. (2d)
232—Ford, Francis, 16, Devonport M.I., engineer—Algebra (3d)
519—Foster, Thomas, 18, Padiham Trades' Hall Inst., mechanic and engineer—Chem. (3d)

537—Foulds, Thomas, 19, Burnley M.I., warehouseman—Bkpg. (1st)
528—Fox, William J., 21, Burnley M.I., book-keeper—Bkpg. (2d)
40—France, James, 17, Ashton-under-Lyne M.I., clerk—Arith. (2); Bkpg. (2d); Geog. (3d).
435—Fraser, John, 16, Pop. Ev. Classes, Andersonian Univ., Glasgow, clerk—Chem. (3d)
70—French, Alfred, 24, Banbury Sc. Sch., baker—Botany (2d)
421—French, Andrew, 25, Pop. Ev. Classes, Anderson. Univ., Glasgow, engine-keeper—Mag. Elect., &c., (3d)
66—Frier, William, 16, Banbridge Lit. and Mut. Imp. Soc.—Geog. (2d)
795—Frith, William, 20, Bollington Use. Know. Soc., cotton warehouseman—Chem. (3d)
1044—Fulton, William, 32, Southampton Ath., grocer's assistant—Music (3d)
1072—Furmage, Wm. D., 20, Wolverhampton W.M.C., engineer—Arith. (3d); Pract. Mech. (3d)

643—Gardner, Thomas, 29, Lichfield W.M.I., national school-master—Bkpg. (2d)
711—Garrett, George W., 21, City of Lon. Col., clerk—Eng. Lit. (1st) with book prize.
272—Garrett, John, 19, Gilford Y.M.M.I.A., clerk—Arith. (1st); Bkpg. (2d); Mens. (3d)
712—Garside, Henry J., 20, City of Lond. Col., clerk—French (3d)
463—Garside, John, 20, Halifax W.M.C., power-loom overlooker—Bkpg. (2d)
912—Gartside, Samuel, 20, Oldham Sc. Sch., Mason—Geom. Dwg. (2d)
396—Gatheral, George, 17, Glasgow M.I., chemist—Chem. (2d)
138—Gaunt, John Edward, 17, Bradford M.I., attorney's clerk—Arith. (2d); Eng. Hist. (2d)
888—Gibson, Robert, 20, Newcastle-on-Tyne Ch. of Eng. Inst., clerk—French (3d)
644—Gilbert, John, 23, Lichfield W.M.I., maltster—French (3d)
962—Gill, James, 21, Paisley Artiz. Inst., shawl pattern designer—Music (3d)
713—Gilson, Robert Baker, 20, City of London College, clerk—Arith. (3d); Bkpg. (2); Eng. Lit. (3d)
596—Glassford, John McLachlan, 19, Leeds M.I., chemist's assistant—Chem. (3d)
1135—Goodall, John C., 17, York M.I., clerk—Arith. (1st); Alg. (2d)
681—Goode, Frederick J., 20, St. Stephen's, Westm. Ev. Sch., schoolmaster—Music (2d)
714—Goode, John, 19, City of London College, tobacconist—French (3d)
235—Goodyear, Thomas H., 17, Devonport M.I., engineer (student)—Alg. (2d); Mens. (3d)
12—Gordon, Robert, 21, Aberdeen M.I., cabinet-maker Free-hd. Dwg. (3d)
85—Gosden, Richard T., 19, Birmingham and Midland Inst., clerk—Arith. (2d)
1142—Gott, Edwin, 24, Calverley M.I., woollen cloth weaver—Arith. (3d); Bkpg. (2d)
1065—Gould, John, 20, Wolverhampton Young Men's Christian Inst., printer—Eng. Hist. (3d)
980—Granger, James Nixon, 17, Portsea Watt Inst., engineer (student)—Pract. Mech. (1st); Princ. Mech. (2d); Geom. Dwg. (2d)
1036—Grantham, Henry, 24, Slough M.I., coach wheel wright—Free-hd. Dwg. (3d)
1120—Green, Alfred B., 20, ironmonger—French (3d)
563—Green, Bernard, 20, Haslingden Inst., piece looker—Arith. (3d); Anim. Phys. (3d); Mens. (3d)
1196—Greenwood, Edwin, 24, Hatherlow M.I. Soc., wire-drawer—Arith. (3d)
806—Greenwood, William, 18, Manchester M.I.—Chem. (1st); Anim. Phys. (1st) with book prize
990—Gretton, John Jenkins, 17, Salford W.M.C., pupil teacher—Arith. (3d); Geog. (3d)
594—Griffith, David, 25, Leeds M.I., bookkeeper—Min. and Met. (1st), with 2d prize; Chem. (2d); Anim. Phys. (2d)
965—Griffiths, Henry, 22, Pembroke Dock M.I., shipwright—Arith. (2d); Eng. Hist. (3d); Geog. (3d)
836—Griffiths, John Alfred, 16, Manchester M.I.—Chem. (2d); Ani. Phys. (2d)
630—Grimshaw, Richard Atkinson, 18, Leeds Y.M.C.A., railway clerk—French (3d)
715—Grosvenor, Edward, 25, City of London Coll., corrector—Music (2d)
716—Ground, William David, 22, City of London Coll., clerk in education office—Geom. (3d)
811—Grundy, Joseph, 21, Manchester M.I., clerk—Bkpg. (1st)
600—Guest, Thomas, 16, Leeds M.I., clerk—Chem. (3d)
599—Gurney, James, 18, Leeds M.I., soap manufacturer—Chem. (3d)

674—Haggitt, Catherine S., 38, London M.I., governess—German (2d)
189—Hall, Charles R., 17, Chelmsford L. and M.I., plumber and painter, &c.—Free-hd. Dwg. (1st)
553—Hall, Edward, 17, Burnley Ch. of Eng. Lit. Inst., pupil teacher—Arith. (2d); Eng. Hist. (2d)
1121—Hall, James Butler, 19, Wakefield M.I., overlooker—Bkpg. (2d)
462—Halliday, John, 21, Halifax W.M.C., warehouseman—Bkpg. (2d)
620—Halliday, John, 22, Leeds Y.M.C.A., warehouseman—Arith. (2d); Bkpg. (1st)
925—Hallsworth, Harry, 19, Oldham Sc. Sch., draughtsman—Geom. Dwg. (3d)
338—Hally, John, 18, Glasgow Inst., clerk—Bkpg. (3d)
717—Halsey, William, 19, City of London Coll., clerk—Arith. (2d)
546—Halstead, James, 21, Burnley M.I., stonemason—Arith. (3d)
332—Hamilton, Thomas, 22, Glasgow Inst., cabinet maker—Free-hd. Dwg. (3d)
859—Hanson, John E., 16, Manchester M.I., clerk—Bkpg. (3d)
718—Harbott, William, 19, City of London Coll., clerk—Bkpg. (1st)
1129—Hardcastle, John W., 19, York Inst. of Pop. Sc., clerk—Algebra (2d)
796—Harding, Edwin J., 18, Bollington Useful Knowledge Soc., teacher (proposed)—Eng. Hist. (3d)
534—Hargreaves, Edmund, 18, Burnley M.I., weaver—Arith. (3d)
1076—Harley, William, 19, Wolverhampton W.M.C., attorney's clerk—Free-hd. Dwg. (3d)
191—Harris, Charles, 18, Chelmsford L. and M.I., pupil teacher—Free-hd. Dwg. (3d); Arith. (3d)
719—Harris, Owen, 17, City of London Coll., clerk—Bkpg. (2d)
814—Harrison, George, 19, Manchester M.I., clerk—Arith. (3d); Bkpg. (2d)
1160—Harrison, John Pownall, 18, Manchester M.I., book-keeper—Eng. Hist. (3d)
129—Harrison, Joseph, 22, Bradford M.I., clerk—Arith. (3d); Eng. Lit. (1st) with 1st Prize; Logic (2d)
1151—Harrison, William, 17, Middlesbro' M.I., farmer—Agric. (3d); Chem. (3d)
1176—Harrison, William, 23, St. Michael's Ev. Sch., Bromley, ship joiner—Arith. (3d)
856—Hartley, Joseph, 23, Hulme Christ Church Inst., —in a chemical yard—Arith. (2d); Chem. (2d)
819—Hartnell, Wilson, 24, Manchester M.I., draughtsman—Bkpg. (2d)
128—Harwood, James, 18, Bolton M.I., mechanic—Geom. Dwg. (3d)
87—Haseler, George Carter, jun., 18, Birmingham and Midland Inst., jeweller—Chem. (3d)

720—Hatch, John J., 19, City of Lon. Col., corresponding clerk—Eng. Hist. (2d); Eng. Lit. (1st)
793—Hatton, Ezra, 18, Macclesfield Use. Know. Soc., gasfitter and brazier—Chem. (2d)
971—Hays, George, 16, Pembroke Dock M.I., pupil teacher—Arith. (2d); Mens. (3d)
626—Hayward, Charles Wm., 19, Leeds Y.M.C.A., stonemason—Arith. (3d)
721—Hayward, James, 20, City of Lon. Col., assistant gardener—Arith. (3d)
548—Healey, Thomas, 24, Burnley M.I., book-keeper—Alg. (1st) with 1st prize; Chem. (1st) with 2nd prize; Mens. (1st) with 2nd prize; Mag. Elect., &c., (2d)
792—Heathcote, George, 16, Macclesfield M.I., pupil teacher—Chem. (3d)
1070—Hemmings, Theophilus, 23, Wolvhamp. W.M.C., schoolmaster and organist—Music (1st)
981—Hemsley, William Botting, 20, Richmond Parochial Library, assistant in the herbarium, Kew—Botany (1st) with 1st prize.
284—Henderson, Henry, 20, Glasgow Ath., clerk—Bkpg. (1st)
765—Heritage, Esther Anne, 24, R. Poly. Inst., teacher—French (1st)
722—Higgins, George, 29, City of Lon. Col., teacher—Music (2d); Anim. Phys. (2d)
1045—Higgs, James H., 27, Southampton Ath., coach-painter—Arith. (1st)
1159—Higham, Matthew, 25, Manchester M.I., book-keeper—Anim. Phys. (2d)
1019—Higson, Hugh, 18, Salford W.M.C., clerk—Bkpg. (2d)
1104—Hill, Henry, 33, Messrs. Chance's Lib., designer—Free-hd. Dwg. (1st) with 1st prize.
253—Hill, James E., 23, Edinburgh Phil. Inst., teacher—Latin, &c. (3d)
1140—Hill, William, 17, Acomb Lit. Inst., clerk—Arith. (3d); Eng. Hist. (3d.)
1042—Hill, William B., 18, Southampton Ath., clerk—Free-hd. Dwg. (3d)
1162—Hills, Henry G., 21, Hertford L. and S.I., printer—Bkpg. (2d); Mens. (2d)
261—Hills, William J. 20, Faversham Inst., chemist—Arith. (2d)
492—Hindle, John E., 17, Hull Young People's Christian and Literary Inst., clerk—German (2d)
1147—Hobson, Richard Hughes, 22, Middlesbro' M.I., clerk—Chem. (3d)
7—Hodge, Maria, 19, Aberdeen M.I.,—Free-hd. Dwg (2d)
465—Hodgson, Alfred, 19, Halifax W.M.C., overlooker—Bkpg. (3d)
361—Holburn, Rbt., 17, Glasgow M.I., clerk—Bkpg. (2d)
558—Holden, Thomas, 20, Burnley Church of England Lit. Inst., cotton weaver—Arith. (3d)
585—Hole, John Mitchell, 17, Leeds M.I., teacher—Eng. Hist. (2d); Geog. (2d); Algebra (3d)
532—Holgate, James, 18, Burnley M.I., clerk—Magnet. Elect., &c. (3d)
662—Hollihead, William, 18, Liverpool Inst., clerk—Arith. (2d); Bkpg. (1st)
1168—Holloway, Frederick G., 18, Stourbridge M.I., bank clerk—Bkpg. (2d)
1128—Holloway, George O'C., 17, Kidderminster M.I., clerk—Arith. (2d); Bkpg. (2d); French (3d)
724—Holman, William, 21, City of London Coll., clerk—French (3d)
485—Holroyd, Joseph H., 18, Hull Young People's Christian and Lit. Inst., clerk—Arith. (1st)
1027—Holt, Andrew, 25, Salford W.M.C., engraver to calico printers—Arith. (3d); Algebra (3d)
629—Holton, William, 20, Leeds Young Men's Christian Assoc., railway clerk—Bkpg. (1st)
569—Hood, George, 19, Haslingden Inst., weaver—Chem. (3d)
667—Hood, William, 20, London M.I., vellum binder—Arith. (1st); Algebra (2d)
725—Hopkins, John, 17, City of Lon. Col., clerk—Arith. (3d)
571—Horrocks, Richard, 18, Haslingden Inst., book-keeper—Bkpg. (2d)
881—Hopps, Michael P., 16, Newcastle-on-Tyne M.I., clerk—Chem. (3d)
1200—Horth, Benjamin, 20, Abbott's Ann Reading-room, assistant master—Arith. (3d); Free-hd Dwg. (3d)
88—Horton, Robert, 20, Birmingham and Midland Inst., clerk—Alg. (2d)
89—Hotchkiss, Edmund, 25, Birmingham and Midland Inst., clerk—German (2d)
1079—Hough, Joseph, 26, Wolverhampton W.M.C., assistant in observatory—German (3d)
170—Howse, Thomas, 22, Bristol Ath., warehouseman Arith. (3d)
400—Houstoun, Andrew McDowall, 19, Glasgow M.I., accountant's clerk—Arith. (3d); Bkpg. (1st) with 2nd prize
1001—Howard, Squire, 18, Salford W.M.C., lithographic artist—Free-hd. Dwg. (2d)
159—Howard, William, 17, Trade and Mining School, Bristol, mining engineer—Chem. (2d).
829—Howarth, James, 18, Manchester M.I., clerk—Eng. Hist. (3d)
678—Howes, Frederick, 19, London M.I., clerk—Eng. Hist. (2d); Alg. (2d)
472—Howorth, Edward, 23, Halifax W.M.C., wool-sorter—Bkpg. (3d)
779—Hubbard, Edmund Isle, 18, Louth M.I., tutor—Arith. (2d); Mens. (3d)
497—Hubbard, George Wm., 17, Ipswich W.M.C., clerk in Probate Court—Geog. (3d)
1078—Hudson, Edwin, 20, Wolverhampton W.M.C., druggist—Chem. (3d)
727—Hudson, William, 28, City of Lon. Col., national school teacher—Chem. (2d); Alg. (2d); Princ. Mech. (2 d).
726—Hughes, John, 20, City of London Coll., chemical assistant—Agric. (1st), with 1st prize
476—Hughes, Robert Thorpe, 24, Halifax W.M.C., warehouseman—Bkpg. (3d)
1117—Hughes, Thomas, 27, Brierley Hill W.M. Club, colliery engine-driver—Arith. (3d)
457—Hughes, William J., 18, Halifax W.M.C., assistant book-keeper—Bkpg. (2d)
1185—Hughes, William J., 18, St. Paul's, Bow Common, Ev. Cl., clerk—Free-hd. Dwg. (3d)
998—Hulme, Edward Barlow, 17, Salford W.M. Coll., clerk—Arith. (2d); Eng. Hist. (2d); Latin (2d)
373—Hunter, William, 20, Glasgow M.I., engineer—Geom. Dwg. (3d)
840—Hurst, Washington, 21, Manchester M.I., joiner—Arith. (1st); Eng. Hist. (3d); Alg. (3d)

392—Inglis, Francis, 16, Glasgow M.I., clerk—Bkpg. (2d)
406—Inglis, William, 23, Pop. Ev. Classes, Andersonian Univ., Glasgow, clerk—French (2d)
181—Irving, Robert, 24, Carlisle M.I., teacher—Alg. (1st); Bkpg. (2d)
1192—Irwin, William G., 24, People's Reading Room, Belfast, clerk—Arith. (3d)
974—Ivemey, Thomas, 23, Pembroke Dock M.I., caulker—Arith. (2d); Eng. Hist. (2d); Geog. (1st), with 1st prize.

*1103—Jack, James Alex., 17, Messrs. Chance's Lib., glass-cutter—Arith. (2d)
202—Jackson, Christopher, jun., 18, Darlington Ch. of Eng. Inst., clerk—Arith. (2d)
799—Jackson, Francis, 16, Bollington Use. Know. Soc., pupil teacher—Arith. (2d); Geog. (3d)
203—Jackson, John, 16, Darlington Ch. of Eng. Inst., clerk—Arith. (1st)

285—Jackson, John, 17, Glasgow Ath., clerk—Bkpg. (2d)
473—Jackson, Joseph Morton, 20, Halifax W.M.C., grocer's assistant—Eng. Lit. (2d)
1106—Jackson, William, 17, Messrs. Chance's Evening School, Oldbury, bricklayer—Arith. (3d)
167—Jefferies, Albert G. W., 21, Bristol Young Men's Christian Assoc., accountant's clerk—Arith. (2d)
602—Jefferson, Mary Anne, 16, Leeds M.I.—Eng. Hist. (3d)
1074—Jenks, Isaac J., 18, Wolverhampton W.M.C.—Arith. (1st)
728—Jennings, Henry, 25, City of London College, articled clerk to a solicitor—Bkpg. (1st)
1000—Johnson, Leanord, 18, Salford W.M.C., clerk—Bkpg. (3d)
619—Johnson, Thomas, 26, Leeds Y.M. Christ. Assoc., warehouseman—Bkpg. (3rd); Eng. Lit. (3d)
286—Johnston, Alexander, 19, Glasgow Ath., railway clerk—Bkpg. (1st); Eng. Lit. (1st), with 2d prize.
988—Jones, Alfred, 30, Salford W.M.C., book-keeper—Logic (2d)
839—Jones, Benjamin, 16, Manchester M.I., warehouse lad—Arith. (1st); Bkpg. (1st)
729—Jones, Henry C., 21, City of Lon. Col.—Bkpg. (2d)
1199—Jones, John M., 21, Hatherlow M.I. Soc., schoolmaster—Arith. (1st)
1017—Jones, William, 17, Salford W.M.C., assistant-teacher—Bkpg. (1st)
415—Josh, Edmund G., 17, Pop. Ev. Classes, Anderson. Univ., Glasgow, chemist—Chem. (2d); Pract. Mech. (2d)

262—Kay, Eliza, 19, Faversham Inst., pupil teacher—Geog. (1st)
855—Kay, James, 16, Manchester M.I., operative—Arith. (2d)
845—Kay, William, 23, Hulme Christ Ch. Inst., mechanic—Arith. (3d); Pract. Mech. (3d)
152—Kaye, Uriah, 17, Bradford M.I., wool-sorter—Bkpg. (2d); Alg. (3d); Mens. (3d)
31—Kearns, Henry, 17, Aldershot Inst., clerk—Eng. Hist. (2d); Alg. (3d)
730—Kelly, James Neil, 23, City of Lon. Col., book-keeper—French (1st) with 1st prize.
287—Kelly, John, 19, Glasgow Ath., mechanic—Latin, &c. (3d)
60—Kennedy, David, 17, Banbridge M.I.S., flax spinning business—Arith. (2d)
731—Kennedy, John, 19, City of Lon. Col., customs clerk—Arith. (1st); Eng. Hist. (2d); French (2d)
289—Kerr, Thomas, 42, Glasgow Ath., manufacturer—Bkpg. (2d)
449—Kerr, William, 19, Pop. Ev. Classes, Anderson. Univ. Glasgow, clerk—Anim. Phys. (2d)
940—Kershaw, Thomas, jun., 23, Oldham Sc. Sch., mechanic—Geom. Dwg. (2d)
664—Keyte, William R., aged 17, London M.I., engineer—Arith. (1st); Prac. Mech. (2d); Mens. (2d)
371—King, James, 26, Glasgow M.I., clerk—Mens. (2d)
410—King, John Falconer, 19, Pop. Ev. Classes, Anders. Univ., Glasgow, chemist—Chem. (1st)
509—King, Henry A., 21, Ipswich W.M. Coll., grocer's assistant—Bkpg. (1st)
176—Kingerlee, George, 25, chemist and druggist—Chem. (2d)
316—Kirkwood, John, 18, Carlton-place Secular Sch., Glasgow, normal student—Anim. Phys. (3d)
825—Knight, James, 21, Manchester M.I., mechanic—Geom. Dwg. (2d)
833—Knowles, James, 20, Manchester M.I., clerk—Bkpg. (2d)

732—Lake, William Smee, 19, City of London Coll., clerk—Bkpg. (2d)
1163—Lambert, James Newton, 18, Hertford L. and S.I., printer's assistant—Arith. (3d)
507—Lansdell, Lawson H., 18, Ipswich W.M.C., clerk—Bkpg. (1st)
196—Larcombe, George, 18, Crewe M.I., fitter and turner—Arith. (3d)
733—Law, Calvert, 23, City of London Coll., clerk—Bkpg. (1st)
985—Law, Edwin, 18, Salford W.M. Coll., clerk—Latin, &c. (2d)
290—Lawrie, D., 18, Glasg. Ath., insur. clerk—Arith. (1st)
871—Lawson, John H., 16, Newcastle-on-Tyne Ch. of Eng., Inst., merchant and shipbkr.—Geog. (2d)
866—Lawton, William, 29, Mossley M.I., watchman—Bkpg. (2d)
408—Leckie, John Sands, 18, Pop. Ev. Classes, Ander. Univ., Glasgow, clerk—French (3d)
493—Lee, Abel, 20, Compstall Inst., weaver—Arith. (3d)
734—Lee, Samuel, 17, City of London College, clerk—Arith. (2d)
994—Lee, Wm., 23, Salford W.M.C., salesman—Chem. (3d)
777—Lendon, Wm. W., 18, R. Polytechnic I., clerk—Bkpg. (1st)
374—Leslie, James, jun., 18, Glasgow M.I., accountant's clerk—Free-hd. Dwg. (3d)
735—Lesslie, Robert J., 20, City of London College, clerk—Bkpg. (1st)
659—Lewin, Edmund Fairhurst, 16, Liverpool Inst., shipbuilder's apprentice—Arith. (1st); Alg. (2d)
736—Lewis, James, 28, City of London College, teacher—Arith. (2d); Princ. Mech. (3d)
561—Liddell, John Pemberton, 19, Haslingden Inst., learning the cotton business—Chem. (3d)
61—Linn, Richard, 26, Banbridge Lit. and Mut. Imp. Soc., shop assistant—Geog. (3d)
886—Livingston, Henry J., 18, Newcastle-on-Tyne Ch. of Eng. Inst., clerk—French (3d)
1123—Logan, Henry, 23, Wakefield M.I., ironfounder—Pract. Mech. (1st) with 2nd prize; Mens. (2d)
63—Logue, James, 20, Banbridge Lit. and M.I.S., N. teacher—Arith (1st); Mens. (2d); Eng. Lit. (3d)
1049—Long, Chas., 29, Southampton, porter—Music (3d)
53—Lord, John, 30, Bacup M.I., warehouseman—Arith. (3d)
565—Lord, John T., 19, Haslingden Inst., piece looker, Chem. (2d)
48—Lord, William, 18, Bacup M.I., clerk—Arith. (1st); Alg. (2d); Chem. (2d)
163—Lorymer, Edward, 19, Bristol Ath., clerk in dock office—Bkpg. (2d)
683—Lough, George J., 17, St. Stephen's Ev. Sch., architect's assistant—Arith. (3d)
67—Love, Albert A., 22, Banbridge Lit. and M.I.S., clerk—Bkpg. (1st)
1089—Ludlam, Isaac S., 16, Wolverhampton W.M. Coll., clerk—Arith. (2d); Bkpg. (2d)

6—MacKenzie, Donald, 23, Aderdeen M.I., stonecutter—Arith. (3d)
395—Mactear, James, 19, Glasgow M.I., chemist—Min. and Met. (2d); Chem. (2d)
137—Maguire, Philip, 16, Bradford M.I., merchant's clerk—Arith. (2d)
90—Maidwell, Robert C., 23, Birmingham and Midland Inst., schoolmaster—Arith. (1st)
363—Main, John, 22, Glasgow M.I., clerk—Eng. Hist. (2d)
1190—Maitland, Alexander S., 18, People's Reading-rooms, Belfast, apprentice to linen manufacturer—Arith. (3d)
1013—Makin, John B., 23, Salford W.M.C., warehouseman—Bkpg. (2d)
91—Mallin, Emala, 21, Birmingham and Midland Inst.—Eng. Hist. (2d); Eng. Lit. (3d)
1071—Mansfield, George, 23, Wolverhampton W.M.C., printer—Music (1st) with 2nd prize
71—Mansfield, Marianne E., 18, Banbury Sc. Sch., teacher—Music (3d)

72—Mardon, Daniel, 19, Banbury Sc. Sch., teacher—Geom. (2d)
882—Mark, John Siddoway, 18, Newcastle-on-Tyne M.I., druggist—Chem. (3d)
580—Marsden, Henry, 18, Rawtenstall M.I., weaver—Chem. (3d)
852—Marsh, James, 23, Hulme Christ Ch. Inst., clerk Arith. (3d)
601—Marshall, Elizabeth, 16, Leeds M.I., scholar—Geog. (3d)
808—Marshall, Samuel, 17, Manchester M.I., pupil teacher—Arith. (2d)
1149—Marshall, William Stone, 16, Middlesbro' M.I., engine fitter—Chem. (2d)
1015—Martin, George, 19, Salford W.M.C., pawnbroker's assistant—Bkpg. (3d)
490—Martin, John, 16, Hull Young People's Christian and Lit. Inst., clerk—Arith. (1st)
843—Martin, Robert Petty, 16, Manchester M.I., chemist—Anim. Phys. (1st) with Book Prize; Geog. (1st); Chem. (2d)
738—Masham, William G., 23, City of London Coll., clerk—Geom. (2d)
*801—Massey, William, 19, Macclesfield M.I., clerk (proposed)—Chem. (1st)
1047—Massy, Charles, 16, Southampton Ath., articled clerk—Arith. (1st)
1048—Massy, William L., 17, Southampton Ath., clerk in ordnance survey office—Algebra (1st)
967—Mathias, George Hitchings, 22, Pembroke Dock M.I., writer—Arith. (3d); Bkpg. (2d)
588—Maude, Joseph, 30, Leeds Church Inst., railway clerk—Bkpg. (2d)
257—May, Thomas, 21, Edinburgh Phil. Inst., clerk—Algebra (3d); Latin, &c., (3d)
369—Mayer, Annie, 18, Glasgow M.I., assistant teacher—Anim. Phys. (3d)
846—McCausland, Alexander, 21, Manchester M.I., cabinet maker—Arith. (1st); Bkpg. (2d)
294—McCunach, James, 20, Glasgow Ath., warehouseman—French (2d)
331—McDonald, Archibald, 42, Glasgow Inst., book-keeper—Free-hd. Dwg. (3d)
293—McDougall, John, 30, Glasgow Ath., book-keeper—Eng. Lit. (3d)
255—McFarlan, Hugh, 19, Edinburgh Philos. Inst., clerk—Arith. (3d); Eng. Hist. (2d)
407—McFarlane, John R., 23, Pop. Ev. Classes, Andersonian Univ., Glasgow, clerk—Botany (3d)
961—McGibbon, Richard F., 25, Paisley Artiz. Inst., watchmaker—Music (3d)
328—McGilchrist, James, 18, Glasgow Inst., clerk—Latin, &c. (3d)
295—McGown, David, 21, Glasgow Ath., railway clerk—Eng. Lit. (3d)
486—McIntosh, Donald, 20, Hull Young People's Christ. and Lit. Inst., clerk—German (2d)
366—McKellar, Elizabeth, 23, Glasgow M.I., teacher—Anim. Phys. (2d)
358—McKenzie, Thomas, 17, Glasgow M.I., clerk—Bkpg. (2d)
342—McLachlan, Samuel, 20, Glasgow Inst., clerk—Bkpg. (2d)
292—McLay, Wm., 23, Glasgow Ath., clerk—Arith. (2d); Eng. Hist. (2d)
952—McLennan, Wm. B., 18, Paisley Artiz. Inst., clerk—Arith. (3d)
1184—McLeod, Albert J., 20, St. Paul's, Bow-common, Ev. Classes, engineer—Free-hd. Dwg. (3d)
269—McMaster, Hugh Dunbar, 20, Gilford Young Men's Mut. Imp. Assoc., foreign correspondent—Arith. (1st); Alg. (2d)
330—McMillan, Andrew, 21, Glasgow Inst., warehouseman—Latin, &c. (2d)
380—McMinn, Thomas, 19, Glasgow M.I., clerk—Arith. (1st); Alg. (3d); Logic (3d)
1193—McMullan, John, 24, People's Reading Rooms, Belfast, clerk—Bkpg. (1st)
349—McMurtrie, John, 17, Glasgow Inst., clerk—Arith. (2d); Bkpg. (2d).
365—McNair, John, 21, Glasgow M.I., wood carver—Eng. Lit. (2d)
318—McNeil, Archibald, 20, Carlton-place Sec. Sch. Ev. Classes, Glasgow, teacher—Music (2d)
1188—McNeill, James, 17, People's Reading-rooms, Belfast, teacher—Arith. (3d); Alg. (3d); Mens. (3d)
297—McPherson, Alex., 18, Glasgow Ath., clerk—Bkpg. (1st)
319—McTyre, James, 18, Carlton-place Sec. Sch., Glasgow, teacher—Anim. Phys. (3d)
298—McWilliam, John, 20, Glasgow Ath., clerk—Bkpg. (1st)
178—Mead, Edward, 16, Bury St. Edmund's M.I., printer—Free-hd. Dwg. (3d)
739—Meadows, William, 16, City of Lon. Col., picture-frame maker—Chem. (1st) with 1st prize; Anim. Phys. (1st) with 1st prize; Geom. (1st) with 1st prize; Magnet. Elect., &c. (3d)
252—Melhuish, William F., 21, Edinburgh Phil. Inst., telegraphist—Magnet. Elect., &c. (2d)
615—Mellor, William, 22, Leeds Y.M.C.A., cloth finisher—Arith. (3d; Bkpg. (2d)
384—Millar, William J., 25, Glasgow M.I., collector—Alg. (3d); Geom. (3d)
451—Miller, Mathew, 17, Gosport and Alverstoke Lit. and S.I., engineer (student)—Navig., &c. (2d); Geom. (2d)
1004—Mills, George, 18, Salford W.M.C., gardener—Free-hd. Dwg. (3d)
1005—Mills, William, 16, Salford W.M.C., clerk—Free-hd. Dwg. (3d)
812—Millward, Frederick, 21, Manchester M.I., draughtsman—Bkpg. (1st)
193—Minns, John W., 16, Crewe M.I., pupil teacher—Arith. (2d)
762—Minter, John, 22, R. Poly. Inst., clerk—Bkpg. (1st)
27—Mitchell, George, 23, Aberdeen M.I., jeweller—Arith. (2d); Free-hd. Dwg. (3d)
868—Mitchell, Geo., 22, Mossley M.I., piecer—Bkpg. (2d)
420—Mitchell, James, 26, Pop. Ev. Classes, Anderson. Univ., Glasgow—Magnet., Elect., &c. (1st) with 1st prize
636—Mitchell, Joseph, 19, Leicester Ch. of Eng. Inst., chemist (apprentice)—An. Phys. (2d); Chem. (3d)
842—Mitchell, William, 17, Manchester M.I., clerk—Arith. (2d)
237—Mogg, Thomas H., 23, Devonport M.I., pawnbroker's assistant—Arith (3d); Eng. Hist. (3d)
218—Mondy, Edmund Felix, 18, shipwright (apprentice)—Alg. (3d)
869—Moorhouse, Thomas, 18, Mossley M.I., hand-loom woollen weaver—Bkpg. (2d)
*356—Morison, Donald, 28, Glasgow Inst., clerk—Eng. Hist. (2d); Geog. (3d)
854—Morris, Thomas, 20, Hulme Christ. Ch. Inst., clerk—Arith. (3d)
1096—Morris, Thomas, 17, W. Bromwich Y.M. Christ. Inst., pupil-teacher—Arith. (1st); Geog. (2nd)
885—Morrison, John, 16, Newcastle-on-Tyne M.I., clerk—French (3d)
139—Mort, Joah, 17, Bradford M.I., clerk—French (3d)
19—Mortimer, John McKay, 22, Aberdeen M.I., mason—Alg. (3d)
54—Morton, James, 18, Bacup M.I., bleacher—Arith. (2d); Chem. (2d)
375—Morton, John, 21, Glasgow M.I., engineer—Prac. Mech. (3d)
34—Moss, George T., 17, Farnham M.I., school assistant—Arith. (3d); Geog. (3d); Music (2d)
1063—Mouilpied, Henry de, 21, Southampton Ath., clerk in H.M. Customs—Arith. (3d); Eng. Hist. (3d)

616—Mountain, Joseph, 20, Leeds Young Men's Christian Assoc., warehouseman—Bkpg. (2d)
92—Mousley, Emily, 22, Birmingham and Midland Inst.—German (2d)
93—Mousley, Mary E., 23, Birmingham and Midland Inst.—German (2d)
950—Muir, John, 27, Paisley Artiz. Inst., accountant—Bkpg. (1st)
639—Muirhead, Andrew, 47, Leicester Ch. of Eng. Inst., staff-sergeant militia—Latin (3d)
780—Mundell, William, 17, Louth M.I., pupil-teacher—Arith. (3d)
*355—Murdoch, Alexander Leamont, 25, Glasgow Inst., Inland Revenue clerk—Arith. (2d); Bkpg. (1st)
291—Murray, James, 21, Glasgow Ath., mercantile clerk—Bkpg. (1st)

205—Naisbitt, George, 20, Darlington Ch. of Eng. Inst., assistant teacher—Arith. (2d)
536—Nelson, John, 16, Burnley M.I., warehouseman—Arith. (3d)
1095—Nevey, George R., 18, Young Men's Christian Inst., West Bromwich, pupil-teacher—Arith. (2d)
378—Newall, Charles M., 25, Glasgow M.I., clerk—Bkpg. (2d)
841—Newby, James, 24, Manchester M.I., shopman—Bkpg. (3d)
1069—Newey, William, 19, Wolverhampton W.M.C., railway spring fitter—Arith. (3d)
919—Newton, George, 18, Oldham Sc. Sch., tin-plate worker—Geom. Dwg. (1st)
165—Newton, Henry C., 18, Bristol Ath., clerk—Arith. (3d); Geog. (2d)
455—Nichol, Learoyd, 17, Halifax W.M.C., assistant-teacher—Arith. (3d); Eng. Hist. (2d)
470—Nicholl, John, 18, Halifax W.M.C., wool-sorter—Bkpg. (3d)
978—Nichols, William D., 16, Peterboro' M.I., clerk—Arith. (1st)
949—Nicholson, John, jun., 31, Paisley Artiz. Inst., clerk—Bkpg. (2d)
1110—Nisbett, George, 18, Kinver Sc. Sch., civil service (proposed)—Arith. (2d)
953—Niven, David C., 22, Paisley Artiz., Inst., collector of gas rates—Arith. (1st)
299—Niven, Robert, 17, Glasgow Ath., lawyer (proposed)—Arith (2d); Latin, &c. (2d)
741—Norris, George M., 22, City of London Coll., clerk—Arith (2d); Alg. (3d); Geom. (3d)
1170—North, Wesley, 16, Hunslet M.I., mechanic—Arith. (3d); Prac. Mech. (3d)
434—Norval, George, 39, Pop. Ev. Classes, Ander. Univ., Glasgow—Pattern card maker—Bot. (2d)
50—Nuttall, Henry, 24, Bacup M.I., weaver—Arith. (2d); Chem. (3d)

609—Oddy, Charles, 30, Leeds Y.M.C.A., time-keeper Arith. (3d)
606—Ogden, Mary Wilson, 16, Leeds M.I., pupil—French (3d)
383—Ogilvie, Thomas, 17, Glasgow M.I., clerk—Arith. (3d); Bkpg. (2d)
424—Ogilvy, David J., 18, Pop. Ev. Classes, Anderson. Univ., Glasgow—Mag. Elect., &c. (2d)
551—Oldham, Joshua, jun., 24, Burnley M.I., power-loom-weaver—Geom. (3d)
243—Oleson, John Rowley, 22, Devonport M.I., shipwright—Alg. (3d); Mens. (3d)
1026—Oliver, Henry, 21, Salford W.M.C., designer—Bkpg. (2d)
1186—Orme, William, 17, St. Paul's, Bow Common, Ev. Cl., iron-moulder—Arith. (3d)
769—Orme, Joseph John, 28, Royal Polytech. Inst., dressing-case manufac.—French (2d); Geog. (2d)

742—Packenham, Jesse John, 30, City of London Coll., viewer, Tower—Dom. Econ. (2d)
301—Pagan, James, 20, Glasgow Ath., clerk—Bkpg. (2d
300—Pagan, Robert, 25, Glasgow Ath., clerk—Bkpg (1st)
613—Page, John W., 20, Leeds Y.M.C.A., warehouseman—Arith. (3d)
357—Parker, John Dunlop, 20, Glasgow M.I., civil engineer—Arith. (1st); Mens. (3d)
1112—Parkes, Samuel, 17, Willenhall Lit. Inst., clerk—Bkpg. (1st)
652—Parkinson, Robert Townson, 25, Liverpool M.I., clerk—Bkpg. (2d)
1153—Pasley, Henry G., Manchester M.I., clerk—Arith. (2d)
504—Paternoster, Robert, 17, Ipswich W.M. Coll., pupil teacher—Bkpg. (1st)
76—Paterson, Frederick, 18, Barnet Inst., clerk (civil service)—Music (2d)
14—Paterson, John, 22, Aberdeen M.I., joiner—Geog. (2d)
77—Paterson, William A., 20, Barnet Inst., builder's clerk—Arith. (3d)
436—Patterson, Thomas Law, 22, Pop. Evg. Classes, Andersonian Univ., Glasgow, clerk—Chem. (1st)
853—Paul, Thomas, 20, Hulme Christ Church Inst., salesman—Bkpg. (3d); French (3d)
1073—Paulton, James, 21, Wolverhampton W.M.C., compositor—Eng. Hist. (3d)
612—Pearce, Joseph, 19, Leeds Young Men's Christian Assoc., warehouseman—Arith. (2d); Geog. (2d); French (3d)
743—Penson, Charles, 25, City of London Coll., clerk—Bkpg. (2d)
1—Peterkin, Henry, 18, Aberdeen M.I., clerk—Geom. Dwg. (2d)
391—Peterkin, William, jun., 19, Glasgow M.I., Civil Eng.—Mens. (3d)
1101—Pewtress, Ebenezer, 20, Messrs. Chance's Lib., Clerk—Bkpg. (2d)
1077—Phillips, Edmund S., 22, Wolverhampton W.M.C., clothier's assistant—Bkpg. (2d)
3—Phillips, William Thomson, 24, Aberdeen M.I., clerk—Bkpg. (3d)
20—Piggie, Thomas, jun., 18, Aberdeen M.I., clerk—Bkpg. (1st)
1122—Pilkington, Herbert, 22, Wakefield M.I., millwright—Arith. (3d); Bkpg. (2d); Prac. Mech. (3d)
51—Pilling, James, 26, Bacup M.I., cotton-weaver—Eng. Hist. (3d)
770—Pitt, Charles, 23, Royal Polytech. Inst., clerk—French (1st)
817—Platford, John H., 22, Manchester M.I., assistant—Bkpg. (2d)
744—Pollard, Henry T., 16, City of London Coll., clerk—Eng. Hist. (2d); Geog. (1st), with 2nd prize.
418—Pollock, Arthur, 17, Pop. Evg. Classes, Andersonian Univ., Glasgow, Turkey-red dyer—Chem. (3d)
13—Pope, Samuel, jun., 26, Aberdeen M.I., draughtsman—Freehd. Dwg. (2d)
1025—Porter, John Edwin, 17, Salford W.M. College, pupil teacher—Bkpg. (3d)
94—Potter, James J., 17, Birmingham and Midland Inst., jeweller—Chem. (2d)
969—Potter, Nicholas C., 17, Pembroke Dock M.I., pupil teacher—Geog. (2d); Eng. Hist. (3d)
1050—Powell, Charles, 17, Southampton Ath., solicitor's clerk—Arith. (2d); Alg. (3d)
745—Powell, Edward, 18, City of London College, clerk—Arith. (2d); Eng. Hist. (2d)
645—Power, John, 19, Lichfield W.M. Inst., grocer's assistant—Arith. (3d)
628—Prestage, John W., 19, Leeds Young Men's Christ. Assoc., cloth dresser—Arith. (3d)
540—Preston, John, 20, Burnley M.I., weaver—Arith. (3d)
566—Priestley, Samuel, 20, Haslingden Inst., shoemaker—Magnet. Elect., &c. (3d)

397—Primrose, Robert Wilson, Glasgow M.I., assistant teacher—Arith. (2d); Alg. (3d)
30—Pritchard, Richd. Christopher, 18, Aldershot Inst., clerk—Arith. (1st); Geog. (2d)
1143—Proctor, Joseph, 19, Farsley M.I., woollen spinner—Arith. (3d)
412—Provand, Dixon, 16, Pop. Ev. Classes, Andersonian Univ., Glasgow, chemist—Chem. (2d)

341—Railton, Alexander B., 20, Glasgow Inst., bookseller—Bkpg. (2d)
747—Rainbow, Francis A., 21, City of London College, clerk—Bkpg. (2d)
95—Randle, John, 24, Birmingham and Midland Inst., printer—Arith. (2d)
604—Rawnsley, George H., 18, Leeds M.I., scholar—Arith. (1st); Eng. Hist. (3d); Alg. (3d)
508—Raymer, Robert, 18, Ipswich W.M.C., pupil teacher—Bkpg. (2d)
924—Reyner, Ernest, 32, Oldham Sc. Sch., mechanic—Geom. Dwg. (2d)
973—Richards, John P., 17, Pembroke Dock M.I., pupil teacher—Arith. (2d)
236—Rickard, George J., 20, Devonport M.I., shipwright—Alg. (1st); Mens. (2d)
555—Riding, William, 18, Burnley Ch. of Eng. Lit. Inst., engineer—Arith. (3d); Prac. Mech. (3d); Mens. (3d)
832—Rigby, Arthur, 18, Manchester M.I., engineer—German (1st) with 1st prize
1083—Riley, Calverley R., 20, Wolverhampton W.M.C., clerk—Bkpg. (1st); Magnet., Elect., &c. (2d); Alg. (2d); Mens. (2d)
1084—Riley, Edwin C., 17, Wolverhampton W.M. Coll., engineer—Geog. (2d)
1018—Roberts, Edward, 24, Salford W.M.C., clerk—Bkpg. (2d)
987—Roberts, Richards, 36, Salford W.M.C., clerk—Logic (2d)
130—Roberts, William H., 17, Bradford M.I., piecer—Arith. (3d); Geog. (3d)
302—Robertson, Emily, 19, Glasgow Ath.—French (1st)
452—Robinson, Dan. E., 19, Gosport and Alverstoke L. and S.I.—Geog. (2d); Eng. Hist. (3d); Alg. (3d)
586—Robinson, Frank, 16, Leeds Church Inst., clerk—French (3d)
621—Robinson, George H., 22, Leeds Y.M. Ch. Assoc., shopman—Bkpg. (2d)
815—Robinson, Henry, 20, Manchester M.I., railway clerk—Bkpg. (1st)
889—Robinson, John M., 32, Newcastle-on-Tyne M.I., clerk—Alg. (2d)
1189—Robinson, Ninian J., 16, People's Reading Rooms, Belfast, apprentice in a linen warehouse—Arith. (2d)
983—Robinson, Richard, 27, Salford W.M.C., indigo dyer—Chem. (2d)
151—Robinson, Samuel, 20, Bradford M.I., carpenter—Arith. (3d)
121—Robinson, Thos., jun., 16, Clitheroe M.I., weaver—Arith. (3d)
608—Robinson, Walter J., 26, Leeds Young Men's Christian Assoc., mechanic—Arith. (2d)
822—Rogers, Alfred, 18, Manchester M.I., warehouseman—Arith. (2d); Bkpg. (2d)
154—Rogers, John Roberts, 36, Bristol Trade School, surveyor's assistant—Chem. (2d)
68—Rogers, Patrick, 30, Banbridge L. and Mut. Imp. Soc., schoolmaster—Arith. (2d); Mens. (3d)
1165—Rogers, T., 39, Stourbridge M.I., clerk—Bkpg. (2d)
*27—Ross, David, 21, Glasgow Inst., teacher—Navig., &c. (2d); Astron. (2d); Geom. (2d)
877—Ross, John A. G., 23, Newcastle-on-Tyne M.I., engineering draughtsman—Chem. (3d)
564—Rostron, Edward Chew, 16, Haslingden M.I., weaver—Chem. (3d)
922—Rothwell, Edmund, 18, Oldham Sc. Sch., clerk—Geom. Dwg. (1st)
884—Rowell, Robert H., 17, Newcastle-on-Tyne M.I, chemist and druggist—Chem. (2d)
1054—Royall, Joseph, 25, Southampton Ath., draughtsman, ordnance survey—Free-hd. Dwg. (2d)
824—Royle, Thomas, jun., 24, Manchester M.I., toolmaker—Geom. Dwg. (3d)
498—Runicles, Edwin Haill, 19, Ipswich W.M.C., pupil teacher—Arith. (1st)
982—Rushforth, John Thos., 19, Rotherham M.I., iron turner—Arith. (1st)
899—Rushworth, John, 25, Oldham Analytical Inst., iron turner—Geom. Dwg. (3d)

550—Sagar, Elijah, 19, Burnley M.I., assistant book-keeper—Arith. (2d); Bkpg. (1st)
529—Sagar, Obadiah, 16, Padiham Trades' Hall Inst., book-keeper—Arith. (3d); Chem. (3d)
826—Sanderson, John Glasgow, 17, Manchester M.I., engineer and millwright—Geom. Dwg. (3d)
1039—Sargeant, John, 19, Slough M.I., carpenter—Geom. Dwg. (2d)
748—Sarll, Andrew, 26, City of Lond. Coll., assistant in a school—Arith. (3d)
894—Scholes, Elijah, 18, Oldham Lyc., clerk—Arith. (3d)
849—Scotson, Joseph, 21, Hulme Christ Ch. Inst., coal dealer—Arith. (3d)
487—Scott, Edwin Lewis, 20, Hull Y.P.C. and L.I., engineer—German (2d)
348—Scott, James, 19, Glasgow Inst., clerk—Bkpg. (2d)
991—Seddon, Robert, 27, Salford W.M.C., warehouseman—German (3d)
959—Semple, Robert, 23, Paisley Artiz. Inst., shawl-pattern designer—Music (2d)
1080—Shann, George Vincent, 17, Wolverhampton W.M.C., clerk—Bkpg. (2d)
143—Sharp, Tom, 17, Bradford M.I., warp-dresser—Geog. (3d)
39—Shaw, John, 16, Ashton-under-Lyne M.I., warehouseman—Arith. (2d); Eng. Hist. (3d); Alg. (3d); Geog. (3d)
454—Shaw, John, 21, Halifax W.M.C., surveyor's clerk—Bkpg. (3d)
672—Shaw, Samuel W., 23, Lond. M.I., merchant—Alg. (3d)
10—Shepherd, Jas., 19, Aberdeen M.I., clerk—Mens. (3d)
15—Shepherd, John, 22, Aberdeen M.I., compositor—French (3d)
1179—Shone, Walter J., 16, St. Pauls' Ev. Classes, Bow Common, clerk—Arith. (2d)
989—Shorrocks, James H., 16, Salford W.M.C., clerk—Free-hd. Dwg. (3d)
915—Sidey, John H., 25, Oldham Sc. Sch., millwright—Geom. Dwg. (3d)
230—Sinnett, Richard, 16, Devonport M.I., engineer student—Arith. (1st); Alg. (3d)
1061—Sinnett, Valentine, 33, Southampton Ath., Sergeant Roy. Eng., employed on ordnance survey—French (1st)
968—Sinnette, James Lewis, 20, Pembroke Dock M.I., shipwright apprentice—Bkpg. (2d)
38—Skelton, John H., 20, South-Eastern Railway M.I., Ashford, railway clerk—Alg. (2d)
184—Skinner, Andrew, 18, Carlisle M.I., stationer—Bkpg. (2d)
677—Slater, Walter, 23, London M.I., clerk—Eng. Hist. (1st), with second prize; Pol. and Soc. Econ. (2d); Logic (1st), with 1st prize.
556—Slater, William, 18, Burnley Ch. of Eng. Lit. Inst., engineer (apprentice)—Arith. (3d)
213—Slater, Susannah, 16, pupil teacher—Arith. (3d); Geog. (3d)
749—Sloper, Arbuthnot J., 18, City of London Coll., clerk—Bkpg. (1st)

*450—Smart, Alex. W., 23, Pop. Ev. Classes, Anderson. Univ., Glasgow, manufacturer—Astron. (3d)
385—Smellie, George, 19, Glasgow M.I., measurer—Mens. (3d)
931—Smethurst, James, 22, Oldham Sci. Sch., stonemason—Geom. Dwg. (3d)
1114—Smith, Benjamin, 23, Dudley, M.I., colliery clerk—Mens. (2d)
552—Smith, Daniel, 18, Burnley Ch. of Eng. Lit. Inst., pupil teacher—Arith. (3d)
158—Smith, David, 17, Mining School, Bristol, mining engineer—Chem. (2d)
750—Smith, Francis E., 29, City of London Coll., clerk—Bkpg. (1st)
669—Smith, George Langley, 16, London M.I., clerk—Arith. (3d)
144—Smith, James, 18, Bradford M.I., warehouseman—Arith. (2d); Bkpg. (2d); Geog (2d)
45—Smith, James Howker, 21, Bacup M.I., weaver—Arith. (3d)
751—Smith, James R., 23, City of London Coll., bootmaker—Bkpg. (1st); Latin, &c. (2d); French (3d)
23—Smith, John Maxwell Dalrymple, 23, Aberdeen M.I., stonecutter—Free-hd. Dwg. (3d)
752—Smith, Thomas, 21, City of London Coll., clerk—Dom. Econ. (2d)
204—Smith, Thomas E., 18, Darlington Ch. of Eng. Inst., assistant teacher—Eng. Hist. (3d); Alg. (2d)
96—Smith, William T., 20, Birmingham and Midland Inst., steel-pen tool maker—French (2d)
1041—Snowball, William, 18, Slough M.I., builder—Geom. Dwg. (3d)
511—Solomon, William, 18, Ipswich W.M.C., engineer (apprentice)—Arith. (2d); French (3d)
343—Sommers, William, 20, Glasgow Inst., clerk—Bkpg. (1st)
5—Sorrie, Peter, 20, Aberdeen M.I., clerk—French (2d)
513—Spashett, Edwin, 30, Ipswich W.M.C., clerk—Bkpg. (2d)
670—Spearing, Mary Ann, 20, London M.I., governess—Eng. Hist. (2d); Latin, &c. (2d)
1099—Spencer, James, 19, Christ Ch. School, Oldbury, pupil-teacher—Geog. (2d)
1180—Spencer, James, 21, St. Paul's Evg. Classes, Bow-common, chemist's assistant—Eng. Hist. (3d); Geog. (2d)
475—Spencer, John, 22, Halifax W.M.C., woolsorter—Arith. (3d)
753—Spiers, William, 17, City of London Coll., clerk—Arith. (1st); Bkpg. (1st)
148—Spinks, Fred., 16, Bradford M.I., grocer's assistant—Geog. (2d)
828—Spriggs, Christopher, 35, Manchester M.I., mechanic—Geom. Dwg. (2d).
1105—Squires, John, 21, Messrs. Chance's Library, certificated schoolmaster—Geom. (3d)
1081—Stanier, Thomas, 16, Stafford-road Wks. Inst., Wolverhampton, engineer—Arith. (2d)
150—Stansfield, James B., 17, Bradford M.I., warehouseman—Geog. (2d); Arith. (3d); Eng. Hist. (3d)
572—Stephenson, Henry, 21, Haslingden Inst., weaver—Chem. (3d)
214—Stevens, William E., 18, pupil teacher—Arith. (3d); Geog. (3d)
303—Stevenson, John, 23, Glasgow Ath., certificated teacher—French (3d)
41—Stewart, Robert, 18, Bacup M.I., assistant master—Arith. (1st); Alg. (3d)
44—Stewart, Robert, 22, Bacup M.I., book-keeper—Arith. (3d); Chem. (3d)
182—Stoker, John Peacock, 17, Carlisle M.I., pupil teacher—Arith. (3d); Geog. (3d)
414—Storer, John Smith, 16, Pop. Ev. Classes, Andersonian Univ., Glasgow, chemical student—Chem. (2d)
954—Strachan, James, 22, Paisley Artiz. Inst., weavers foreman—Arith. (3d)
754—Straight, Robert Marshall, 17, City of London College, clerk—Arith. (1st); Bkpg. (1st)
381—Struthers, Andrew, 19, Glasgow M.I., clerk—Latin, &c. (2d)
484—Stuart, Wm., 19, Hull Young People's Christ. and Lit. Inst., merchant's clerk—German (3d)
21—Sturm, Alexander M., 19, Aberdeen M.I., draper—French (2d)
1181—Sturrock, William, 24, St. Paul's Ev. Classes, Bow-common, clerk—Arith. (3d); Geog. (2d)
172—Stutchbury, George F., 19, Bristol Ath., clerk—Arith. (1st)
761—Sudell, Henry J., 23, City of London College, clerk—Bkpg. (1st); Eng. Lit. (1st) with book prize.
527—Sumner, Henry, 21, Burnley M.I., weaver—Arith. (3d); Bkpg. (2d)
*1166—Sutton, George D., 17, Stourbridge Ch. of Eng. Assoc., pupil teacher—Geog. (3d)
467—Sutton, James, 23, Halifax W.M.C., warehouseman—Arith. (3d); Bkpg. (3d)
665—Symes, Maurice, 19, London M.I., clerk—Arith. (1st); Eng. Hist. (2nd); Geog. (3d)
666—Symons, James Sutherland, 28, London M.I., clerk—Eng. Hist. (2d); French (2d)

1091—Tart, John Bailey, 24, Bilston Inst., grocer's assistant—Arith. (2d)
1020—Tate, Harry Booth, 16, Salford W.M.C., clerk—Arith. (3d); Bkpg. (1st)
651—Tate, Walter, 18, Liverpool Coll. Inst., Civil Service—Geog. (2d)
264—Taylor, Barron G. H., 17, Faversham Inst., clerk Eng. Hist. (3d)
622—Taylor, John, 19, Leeds Y.M.C.A., hatter's assistant—Bkpg. (2d)
807—Taylor, Wm., 16, Manchester M.I., assistant in an office—Bkpg. (2d)
946—Taylor, Wm., 27, Oldham Sci. Sch., mechanic—Geom. Dwg. (2d)
997—Teasdale, George, 28, Salford W.M.C., warehouseman—Logic (2d)
897—Tetlow, James, 16, Werneth M.I., joiner, &c.—Arith. (3d)
234—Thearle, Samuel, 18, Devonport M.I., shipwright apprentice—Bkpg. (2d); Mensur. (1st)
251—Thomas, Charles B. C., 18, Devonport M.I.—Arith. (3d)
913—Thomas, George, 25, Oldham Sci. Sch., mechanic Geom. Dwg. (2d)
870—Thomas, Halliwell, 18, Mossley M.I., piecer—Bkpg. (2d)
547—Thompson James, 22, Burnley M.I., clerk—Arith. (2d); Bkpg. (1st)
1011—Thompson, John, 18, Salford W.M.C., warehouse clerk—Arith. (2d)
861—Thompson, Joseph, 16, Manchester M.I., clerk—Bkpg. (3d)
359—Thomson, Archibald, 27, Glasgow M.I., student—Eng. Lit. (1st) with 3d prize
405—Thomson, James A., 17, Pop. Evg. Classes, Andersonian Univ., Glasgow, clerk—French (3d)
305—Thomson, Laurence, 18, Glasgow Ath., law clerk—French (2d)
883—Thorburn, John, 18, Newcastle-on-Tyne M.I., clerk—Chem. (2d)
258—Thornicraft, Thomas C., 18, Faversham Inst., apprentice to a surgeon—Arith. (3d)
1141—Thornton, William, 23, Calverley M.I., woollen cloth weaver—Arith. (3d)
614—Tiffany, John Barnes, 20, Leeds Young Men's Christian Assoc., tobacco manufacturer—Arith. (2d)

1085—Timbs, Richard, 26, Wolverhampton W.M.C., clerk—Arith. (3d)

1108—Timmins, Thomas, 17, Messrs. Chance's Ev. Sch., Oldbury, working chemist—Bkpg. (3d)

1009—Tinling, Thomas, 19, Salford W.M.C., warehouseman—Bkpg. (3d)

183—Todd, Garnett, 18, Carlisle M.I., clog-maker—Arith. (3d); Bkpg. (2d)

584—Todd, William, 17, Leeds M.I., woollen manufacturer—Eng. Hist. (1st) with 1st prize; Logic (3d)

573—Tomlinson, Matthew, 27, Rawtenstall M.I., spinner—Arith. (2d); Anim. Phys. (3d); Mens. (3d)

576—Tomlinson, Thomas, 19, Rawtenstall M.I., mule-spinner—Arith. (3d); Chem. (3d)

816—Topliff, Samuel, 20, Manchester M.I., clerk—Bkpg. (2d)

26—Tough, James, 18, Aberdeen M.I., pupil teacher—Eng. Hist. (2d)

755—Tongue, Alfred H., 18, City of London Coll., clerk—Bkpg. (1st)

245—Treleaven, Joseph T., 19, Devonport M.I., ship wright—Arith. (2d)

820—Tudor, Edward, 19, Manchester M.I., clerk—Bkpg. (1st)

304—Turnbull, George, 28, Glasgow Ath., clerk—French (2d)

17—Urquhart, Peter, 21, Aberdeen M.I., Clerk—Bkpg. (1st)

268—Valentine, William, 23, Gilford Y.M. Mut. Imp. Assoc., clerk—Arith. (1st)

757—Vaughan, George, 20, City of London Coll., clerk—Alg. (2d)

758—Vaughan, William, 23, City of London Coll., clerk—Astron. (1st), with 1st prize

1046—Vokes, Thomas Bouchier, 19, Southampton Ath., clerk—Arith. (3d)

1177—Vousden, Joseph F., 18, St. Michael's Evg. School, Bromley, clerk—Arith. (3d)

372—Waddington, Albert, 21, Glasgow M.I., Inland Revenue officer, Arith. (3d)

306—Wade, James, 27, Glasgow Ath., cashier—French (1st), with 2nd prize; Geom. (3d)

632—Wainwright, Henry, 20, Leeds Y.M. Christian Assoc., clerk—Alg. (3d)

648—Waldren, Arthur C., 19, Lichfield W.M.A., draper—Arith. (3d)

598—Walker, Thomas, 22, Leeds M.I., forgeman—Mining and Metallurgy (3d); Chem. (3d)

22—Wallace, Thomas, 22, Aberdeen M.I., assistant teacher—Principles of Mechanics (3d)

307—Wallace, Thomas Macfarlan, 21, Glasgow Ath.—clerk—Bkpg. (1st)

487—Wallace, William Emerson, 18, Pimlico Lit. Sci. and M.I., clerk—Alg. (2d); Mensur. (3d)

898—Walwork, James, 20, Henshaw-street Mut. Imp. Soc., weaver—Arith. (2d)

42—Walsh, James, 18, Bacup. M.I., throstle overlooker—Arith. (3d); Chem. (3d)

471—Walsh, James, 19, Halifax W.M.C., warehouseman—Bkpg. (2d)

228—Walter, Elijah, 21, Devonport M.I.—Arith. (3d); Bkpg. (2d)

809—Walton, Henry, 17, Manchester M.I., clerk—Arith. (3d); Bkpg. (1st)

879—Walton, John, 18, Newcastle-on-Tyne M.I., druggist—Chem. (3d)

611—Walton, John Ash, 20, Leeds Y.M. Christian Assoc., clerk—Bkpg. (1st); Arith. (3d)

559—Walton, Robert, 20, Burnley Ch. of Eng. Lit. Inst., weaver—Arith. (3d); Chem. (2d)

4222—Warcup, Albert, 21, clerk (prop.)—Eng. Hist. (3d)

134—Ward, Samson, 21, Bradford M.I., woolsorter—Arith. (3d)

75—Ward, Thomas, 21, Banbury Sc. Sch., commercial clerk—Botany (2d)

574—Wardleworth, William, 19, Rawtenstall M.I., book-keeper—Anim. Phys. (3d)

355—Wardrop, Thomas, 19, Glasgow Inst., clerk—Arith. (3d)

934—Wareing, William, 20, Oldham Sc. Sch., mule spindle maker—Geom. Dwg. (1st)

941—Warrenner, Herbert, 31, Oldham Sc. Sch., overlooker—Geom. Dwg. (3d)

759—Waters, William, 18, City of London Coll—Eng. Hist. (1st) with 3rd prize; Arith. (2d); Alg. (3d)

1030—Watson, Jos., 20, Slough M.I., apprentice to a law stationer—Geom. Dwg. (1st); Free-hand Dwg. (3d)

918—Watson, Mark, 24, Oldham Sc. Sch., mechanic—Geom. Dwg. (2d)

642—Watts, Thomas, 18, Lichfield W.M. Inst., draper—Bkpg. (3d)

456—Webster, Oates, 17, Haley-hill W.M.C., Halifax, Bkpg. (1st)

219—West, George, 19, assistant master—Geog. (1st)

481—Wheeler, Edwin, 16, Hitchin M.I., pupil-teacher—Geog. (2d)

766—White, Andrew T., 16, Royal Polytechnic Inst., upholsterer—Arith. (2d)

147—White, Edwin, 18, Bradford M.I., warehouseman—Geog. (2d); Eng. Hist. (3d)

248—White, Henry G., 22, Devonport M.I., shipwright—Eng. Hist. (1st) with book prize; Trig. (2d); Mens. (2d)

685—Whitehouse, Henry Innes, 18, St. Stephen's Ev. Sch., pupil teacher—Arith. (2d)

582—Whittaker, James, 17, Rawtenstall M.I., storekeeper—Chem. (3d)

764—Wickham, Charles T., 21, Royal Polytech. Inst., teacher—German (2d)

506—Wilde, William, 19, Ipswich W.M.C., currier's apprentice—Eng. Lit. (2d)

440—Wilkie, John, 17, Pop. Ev. Classes, Anders. Univ., Glasgow, studying colliery management—Min. and Met. (3d)

186.—Wilkins, William, 17, Chatham, &c., Inst., clerk—Arith. (1st), with 2nd prize; Alg. (2d)

778—Wilkinson, Burgess, 17, Louth M.I., pupil teacher—Eng. Hist. (3d); Geog. (2d)

140—Wilkinson, Swaine, 22, Bradford M.I., warehouseman—Arith. (1st); Dom. Econ. (1st), with 2nd prize.

1109—Willetts, John, 23, Cradley Night Sch., clerk—Arith. (3d)

848—Williams, John, 18, Manchester M.I., clerk—Arith. (3d); Bkpg. (1st)

663—Williamson, Jonathan, 18, Liverpool Inst., engineer—Alg. (3d); Geom. (2d)

448—Williamson, William, 26, Pop. Evg. Classes, Andersonian Univ., Glasgow, coal miner—Mining and Metallurgy (1st), with 1st prize.

538—Williamson, William, 22, Burnley M.I., mechanic—Pract. Mech. (2d)

466—Wilson, Clarke, 18, Halifax W.M.C., brushmaker (apprentice)—Arith. (3d); Bkpg. (3d).

488—Wilson, Edwin, 25, Hull Young People's Christian and Lit. Inst., hosier—Eng. Hist. (2d)

450—Wilson, James, 21, Pop. Evg. Classes, Andersonian Univ., Glasgow, draughtsman—Mens. (2d)

308—Wilson, John, 19, Glasgow Ath., clerk—Bkpg. (1st)

324—Wilson, Matthew, 19, Carlton Place Sec. Sch., Glasgow, teacher—Anim. Phys. (3d)

309—Wilson, Rt., 19, Glasgow Ath., clerk—Arith. (1st)

763—Wilson, Thomas, 22, Royal Polyt. Inst., clerk—Eng. Lit. (3d)

49—Wolfenden, Joshua Lord, 23, Bacup M.I., weaver—Chem. (3d)

847—Wood, David Williams, 18, Manchester M.I., clerk—Arith. (3d); Bkpg. (1st)

634—Wood, James Hartley, 18, Leeds Y.M. Christian Assoc., pupil-teacher—Alg. (2d); Geom. (3d)
505—Wood, John, 25, Ipswich M.I., engineer's clerk—Bkpg. (1st)
541—Wood, Martin, 22, Burnley M.I., house servant—Arith. (3d); Bkpg. (2d)
844—Wood, Thomas, 17, Manchester M.I., warehouseman—Arith. (2d); Mens. (3d)
930—Wood, Thomas, 30, Oldham Sc. Sch., clerk—Geom. Dwg. (1st), with 2nd prize
474—Woodhead, David, 18, Halifax W.M.C., oilcloth maker—Bkpg. (3d)
*1167—Woodhouse, Thomas, 17, Stourbridge Ch. of Eng. Y.M. Inst., pupil-teacher—Arith. (3d); Geog. (3d)
241—Wotton, George Gilpen, 20, Devonport M.I., attorney's clerk—Arith. (2d)
489—Wright, Charles W., 17, Hull Y.P.C. and L.I., clerk—Arith. (1st); Eng. Hist. (1st) with book prize.
903—Wright, John T., 19, Werneth M.I., clerk—Alg. (1st) with 2d prize; Bkpg. (2d); Mens. (2d)
592—Wright, John W., 19, Leeds M.I., chemist—chem. (3d)
73—Wright, Richard J., 18, Banbury Sc. Sch., pupil teacher—Anim. Phys. (1st)
135—Wright, Samuel, 20, Bradford M.I., solicitor's clerk—Arith. (1st); Bkpg. (2d); Geom. (3d)

1067—Yates, Frederick, 26, Wolverhampton Y.M.C.I., clerk—German (3d); French (3d)
533—Yeadon, John, 27, Burnley M.I., engine minder—Practical Mechanics (3d)
1075—Yeaman, Nicholas, 32, Wolverhampton W.M. Col., teacher—Arith. (3d)
233—Yeo, John, 16, Devonport M.I., engineer student—Algebra (2d)
1066—Young, Hannah Eliza, 25, Wolverhampton Young Men's Christian Inst., schoolmistress—Music (1st); Geog. (1st)
633—Young, William, 18, Leeds Young Men's Christian Assoc., boiler maker—Arith. (3d)
310—Young, William Gillies, 35, Glasgow Ath., clerk French (2d)

Proceedings of Institutions.

Marylebone Literary and Scientific Institution.—The report for the half-year ending 22nd April, presented at the adjourned half-yearly general meeting, on Monday, 23rd May last, says, that at the close of this, the thirty-first year of the existence of the Institution, the committee congratulate their fellow members upon the favourable state of the finances, and upon the improved prospects of the Institution. At the last half-yearly meeting, held in November, 1863, the committee had to report that, finding the debts of the Institution had reached such an amount that an effort was absolutely necessary to pay them, and prevent the closing of the Institution—they laid the case before the President, Sir F. H. Goldsmid, Bart., who in a most munificent manner at once promised to forego his claim of £462 10s. if the remainder of the amount could be obtained. To attain this object a canvassing committee was formed, and by their efforts, assisted by the liberal donations of His Grace the Duke of Portland and Sir S. Scott, Bart., and Co., the required amount was collected. Mr. Parker has been elected a life member upon the termination of his engagement as paid secretary, and Mr. Barringer has been appointed his successor. As an experiment, it is proposed to provide a smoking and conversation room for gentlemen, and a private reading room for ladies. The total number of members whose subscriptions were paid was 251, as compared with 283 in May, 1863. In addition to those there were 64 members whose subscriptions were in arrear. The number of members falls far short of the minimum required to support the Institution, viz., 500. Various lectures and entertainments were given during the past season. The committee have increased the subscription to the united libraries. Finding that the classes are not appreciated by the members to the extent which their cost would justify, the committee have under consideration the making a specific quarterly charge to the members of each class.

Midland Railway Literary Institution.—The report for the year ending March 31st last says, that in taking a retrospective view of the progress of the Institution for the last five years, there has been a gradual accession of members. In the year ending March 31st, 1860, the average number on the books was 406, and the amount of subscriptions £74 18s. 5d.; in the year just closed, the average number has been 500, and the amount received in subscriptions £96 17s. 6d. The total receipts from all sources, this year, are £133 13s. 6d. A considerable number of new works have been added to the library. The reading-room is well attended, and additional papers and periodicals have been taken in. At the commencement of last summer several members of the mutual improvement class though there was sufficient energy amongst them to keep up their meetings all the year. The attempt was therefore made, and proved successful until the summer was drawing to a close, when such a falling off in the attendance took place, that it was thought the class must discontinue its sittings. Such was, however, not the case, A special meeting of the members was called, and new life and vigour was infused into the class, which has steadily and surely progressed. Among the proceedings have been debates on the following subjects:—"Ought Government to interfere in the education of the people?" "Is reason confined to man?" "Which is the best form of government—a limited monarchy or a republic?" "Would the recognition of the Southern States of America tend to abolish slavery?" "Ought the Government of this country to render substantial aid to the Poles in their efforts to regain their independence?" "Is the ballot more desirable than open voting?" "Is universal suffrage just and desirable?" "Was the Act of uniformity of 1662 justifiable?" Six essays have been written, the subjects were:—"Mormonism and the Bible;" "Perseverance;" "The Indian Mutiny—its causes and results;" "Does phrenology prove that the lower animals reason?" "Mental Improvement;" and "War and peace contrasted." The rest of the proceedings have consisted of readings, recitals, conversations, and speeches. As the members of the class had formed the project of holding a festival among themselves and their friends on the 23rd of April, 1864, in honour of the tercentenary of the birth of Shakespeare, the Tuesday evenings between the middle of January and the end of March, 1864, were devoted exclusively to readings and recitals of his works, and in making suitable selections to be recited by the class on the occasion. The algebra and arithmetic class commenced its fourth annual session in September, 1863, and was attended by 24 members.

Manufactures.

Fuel for the Forge.—Some experiments were recently made at the works of Messrs. Clinton and Owen, in Whitefriars, with a new description of fuel patented by Mr. Wall, and named by the inventer napthaline, or olate of coal. The chief advantage in it is said to be that the sulphurous vapour arising from the fuel in ordinary use is neutralised.

Painters' Stainers' Company.—The fourth annual exhibition of works in decorative art will be open gratis to the public during the present month. The prizes have been awarded this year as follows:—The silver medal to Mr. W. J. Hoodless, for graining; to Mr. D. Haswell, for

illuminated graining; Mr. J. Rogers, for decorative art; and to Mr. F. Stuart, for graining and marbling. The bronze medal has been won by Mr. George Longley, for illuminated and mediæval writing; by Mr. James Smith, for marbling and graining; Mr. J. Burnby, for two very elegant decorative panels; and Mr. J. Cloake, for inlaid marbling remarkable for unity of effect. Mr. W. Gray, Mr. A. Coggan, and Mr. F. W. Burford have each received a certificate of merit for illuminated writing, graining, and marbling, and decorative panels, respectively. Mr. Laing's £5 prize has been given to Mr. W. Homann, for a decorative panel and design. In order to give the gainers of prizes all the substantial benefit possible with the limited means possessed by this ancient company, the freedom of it is conferred upon each successful candidate on paying the government stamp duty. It will be remembered that in 1860 the Society of Arts contributed towards the prizes awarded at a similar exhibition.*

Extension of the Factory Acts.—The Government bill founded upon the report of the Children's Employment Commission, proposes to enact that the Factory Acts shall apply to the manufacture of earthenware, except bricks and tiles, not being ornamental tiles; the manufacture of lucifer matches, percussion caps, of cartridges; the employment of paper-staining, of fustian-cutting, and of finishing, hooking, lapping, making up or packing yarn or cloth of cotton, wool, silk, or flax, or any other materials in shipping warehouses or finishers' works, or those of makers-up and packers. All such factories are to be kept in a cleanly state, and so ventilated as to render harmless, so far as is practicable, any gases, dust, or other impurities generated in the process of manufacture that may be injurious to health. Special rules, to be sanctioned by the Secretary of State, may be made by the manufacturer for compelling, under penalties, the observance by the workmen of the conditions necessary to insure the required cleanliness and ventilation. For the first six months after the passing of the bill children of not less than eleven years, and for the first thirty months children of not less than twelve, may be employed as young persons exceeding thirteen may under the existing Factory Acts. For the first eighteen months the law against young persons and women remaining during mealtime in a room where a manufacturing process is carried on, and the law that young persons in a factory shall have the time for meals at the same period of the day, is not to apply to paper-staining or to earthenware manufacture. In a lucifer match factory the meals of young persons or women are not to be taken where any manufacturing process, except that of cutting wood, is carried on. In fustian-cutting no child under eleven is to be employed, or, as the bill phrases it, "until the attainment of the age of eleven years."

Colonies.

Railways in New South Wales.—The railway works in progress in this colony are chiefly those for the extension of the three trunk lines into the interior, contracts being now in hand for the formation of fifty-five miles on the southern line, of thirty-eight miles on the western, and of fifteen miles on the northern.

Cotton Growing in New South Wales.—Some of the most active promoters of cotton growing in the colony have come to the conclusion that its success is doubtful. This, however, is not owing to the cost of labour (as is generally supposed), nor to the character of the soil, but to the great uncertainty of the seasons. At one time there is a total absence of rain, and at others there is an inundation amounting to a flood, no two seasons having the same character. The vintage rains, which are now proverbial in New South Wales, must always, more or less, interfere with the gathering of the crop, to say nothing about the absence of rain at the time of its sowing. The company formed several months since in Sydney for solving the problem as to whether cotton would or would not grow in the colony has been dissolved.

Colonial Wool.—From the mere appearance of present prices, compared with last year, it might be assumed that an advance had taken place, but the great improvement in the growth and condition of Port Phillip, Queensland washed, and South Australian and New Zealand greasy flocks, is fully an equivalent, and buyers have only paid more for a much superior article.

Gold Fields in New South Wales.—The principal feature in the gold-fields for the month of March was the large yield from two claims on the Wentworth Fields, near Orange River. But although we have this large yield of gold the payable ground is confined only to one or two claims. And here it may be as well to avail of the opportunity of pointing out that the frontage system, upon which this field is being worked, will, as in the case of the Lachlan, lead eventually to the ruin of the field. Already hundreds have been on the ground in the hopes of being able to set in to work, but owing to the system upon which the ground is taken have been unable to do so. They have hung about, shepherding the claims, until their means were exhausted, and then left the spot. The consequence of the continuance of the mining regulations adopted has been that although in two claims there has been this large yield, not more than two or three others are paying, and the rest are doing nothing. If the block system were adopted, and the miners allowed to take up their prescribed area where they chose, the diggers would at all events have a chance of getting something, and, as from all appearance there is no regular lead, the gold seeming to be in heavy patches rather than in a continuous gutter, it would be for the benefit of the miners generally to declare the ground open to be worked in blocks. If this is not done it may be expected to see the same failure here that has so recently taken place at Lachlan; much highly auriferous ground will be left unworked, whilst hundreds of men who only ask to be allowed to set in upon it will be compelled to stand by and look idly on.

Obituary.

William Johnson Fox was the son of a small farmer at Uggeshall, near Wrentham, in Suffolk, where he was born in 1786. Shortly after his birth, however, his father removed to Norwich, and thenceforth worked there as a weaver, his son, during his early years, working with him as a factory boy. This fact Mr. Fox recalled when he wrote a striking series of letters against the corn laws, under the signature of a "Norwich Weaver Boy." His parents belonged to a body of Nonconformists of old standing in Norwich, and the boy, having shown signs of superior talents, was sent to a small Congregational college at Homerton, then under the presidency of the late Dr. Pye Smith, and he entered on the work of the ministry in the usual way, but he speedily left the communion to which his parents belonged, and eventually took up a position, unconnected with any denomination, as preacher or lecturer at South-place Chapel, Finsbury. While there he took an active part in public affairs, writing habitually in the leading political journals as well as in a magazine that he established himself. He joined Sir William Molesworth, Mr. J. S. Mill, and others in establishing the *Westminster Review*, and is said to have written the first article in the first number. When the anti corn-law agitation was organised, Mr. Fox's power as a speaker made him a valuable acquisition to the active taff of the league, and in the course of a few months he

* See Journal, Vol. IX., p. 431.

appeared on the free trade platform in most of the large towns of England. On the dissolution of the league in 1847 he was returned to Parliament as member for Oldham, and, with the exception of a few months, continued to represent that borough until about a year and a half ago, when failing health obliged him to resign his seat. He was elected a member of the Society of Arts in 1853, and some years since took an active part in its proceedings, particularly those having reference to its Union of Institutions and educational operations. He died on the 3rd instant.

Notes.

Tasmanian Jams.—The *Hobart Town Advertiser* states that four firms in that town manufactured last year 360 tons of jam for exportation.

Albert Memorial in Hyde-park.—The sculptors to whom the execution of the sculpture of the memorial has been confided are—for the larger groups of the quarters of the globe, Mr. MacDowell, R.A., the execution of the group of Europe; Mr. Foley, R.A., Asia; Mr. Theed, Africa; and Mr. Bell, America. For the upper stage, Mr. Marshall, R.A., Mr. Weekes, R.A., Mr. Lawlor, and Mr. Thornicroft have received commissions for groups of Agriculture, Arts, Manufactures, and Commerce.

Correspondence.

Captain Fowke's Monster Tent.—Sir,—I hope you will allow me space for a few observations upon the notice which appeared in the *Times* last week, upon the tent erected in the Gardens of the Horticultural Society at their last *fête*. I am content that Captain Fowke be as victorious among tent makers as he is among architects, but I am sure he would be the first to disclaim the founding his reputation on the disparagement of others, as suggested in a paragraph which has gone the round of the newspapers. So far from "the best tent-makers in the kingdom having been unwilling to undertake the construction of Captain Fowke's great tent on a new principle," I had myself agreed to construct it, as I had done all other tents for the Society for thirty-two years while at Chiswick, with the exception of the one in 1862, which they chose to erect by contract, and which signally failed, to their great loss and confusion. Captain Fowke supplied me with his model, which I was to carry out, as arranged, under his own direction; but, to my surprise, the model was subsequently recalled, Captain Fowke informing me that the construction was to be submitted to competition. This I declined, as no specifications were furnished. The result has been, the employment of "a naval force of sail-makers," an unfair use, in my opinion, of Government *employés* against a private tradesman. Again, "the experience of 1862," in the particular tent alluded to, does not warrant the discredit on all tent-makers implied in the words, "the peril attending all tents on the old principle." My own experience of tent-making runs through half a century, without having had one blow down, not even at Balaklava, where Government pegs, poles, and canvas came down with a run. It is in no spirit of rivalry that I point out that Captain Fowke's pavilion is an edifice, not a tent; pillars "6ft. at the base," iron wire ropes two-thirds of a foot in circumference, "tightened by screws," anchors weighing a ton each, buried 10ft. deep in the earth, and held there by baulks of timber "10ft. long and a foot square, fixed across the flukes," constitute sufficient skeleton ribs and frame for an arcade. Given any expense and any weight, with any strength, and a tent may be made either a house, a church, or a palace, at the option of the committee of noblemen and gentlemen ordering one of—Benjamin Edgington.

Gas-Lighting.—Sir,—In the *Revue des Deux Mondes* for March 15, 1864, is an article on "Gas-lighting" by M. Payen, a well-known writer on technological subjects, which, I think, requires some notice, if only for the purpose of pointing out the fact that discovery and invention are not always born in France, and that they do not in all cases owe their parentage to Frenchmen. M. Payen, after referring to the importance of gas-lighting, in a manufacturing and social point of view, taking rank, as he says it does, immediately after coal, iron, the construction of machinery, textile fabrics, and sugar, transforming, in the happiest manner, night into day, promoting good order and security, insists that such an invention, of French origin (*d'origine Française*), assuredly deserves, &c. So startling an assertion as that contained in the words in Italics, requires proof, and what is the proof given by our author? namely, that "an engineer of roads and bridges, Philippe Lebon, towards the end of the last century, created the manufacture of illuminating gas by the decomposition of wood and coal. This prime invention made a great impression on the public mind, when between 1785 and 1800 it was realised by the appearance of the thermo-lamp. This apparatus, which was very simple in construction, was a sort of stove, furnished with some accessory apparatus, which enabled it to supply, as its name indicates, both heat and light. It also served another purpose, viz., the production of charcoal or coke, a smokeless fuel for domestic use." After more praise of the inventor, and the statement that the gas was to be purified and to be conveyed by subterranean tubes to great distances, for the purpose of heating and lighting both in public and in private, it is quietly announced that the invention failed, because it aimed at a threefold object where one ought to have been sufficient. Another slight objection is referred to in a note, in which it is modestly stated that this apparatus with a triple object had also a threefold danger, viz., it might blow up the house, set it on fire, or suffocate the inhabitants. Hence it was suppressed by the authorities. The writer then goes on to state that in 1792 Murdoch, in London, made a successful experiment; nevertheless, "it was not till ten years later, that is to say, twenty-six years after the primitive invention by Lebon, that Murdoch succeeded in lighting up the factory of Boulton and Watt, at Soho." After giving this word to Murdoch, our author brings in a host of French names, who did all that was required in the production, purification, and distribution of street gas. Now, all this is unfair, not singularly unfair, because it is unfortunately the usual mode of treating such subjects adopted by French writers. Everyone at all acquainted with the literature of the subject knows that in 1667 Mr. Shirley described, before the Royal Society, a burning spring at Wigan, in Lancashire, and traced the origin of the gas to the beds of coal beneath; he also pointed out that the same kind of gas might be procured by the combustion of coal. In 1739 we have a letter printed (*Phil. Trans.*), but written to Boyle, who died in 1691, and, of course, written before his death, in which the method of procuring gas from the distillation of coal is described. Dr. Hales, in his work on "Vegetable Statics," published in 1726, states that he obtained 180 cubic inches of gas, weighing 51 grains, by distilling 158 grains of Newcastle coal. "This result," says Mr. Hughes in his "Treatise on Gas-works," "which is rather more than 8,500 cubic feet per ton, agrees very nearly with the production of gas actually realised from Newcastle coal at the present day." In 1733, Sir James Lowther described (*Phil. Trans.*) the inflammable air of a coal mine near Whitehaven, and in 1765, a proposal was made to the magistrates of Whitehaven to convey this gas through pipes to light the streets of the town, and the proposer, Mr. Spedding, proved the practicability of the idea by conveying the gas into his own office, which he illuminated by its means. Watson, in his "Chemical Essays," published in 1767, shows that coal gas retained its inflammability after having been

passed through water, an important step in its purification. Mr. Murdoch made known the results of his experiments on the gas from coal, peat, wood, and other inflammable substances, and showed the practical value of his results by lighting his own house and office, at Redruth, with the gas. This was in 1792. He distilled the coal in iron retorts, and conveyed the gas through tinned, iron, and copper tubes to a distance of 70 feet. Thus, while M. Lebon was engaged in a series of dangerous failures, Murdoch had completed his invention so far as to apply it safely to the purposes of illumination. There are several points in M. Payen's article which are equally open to criticism, but for their discussion more time and space would be required than I can give and you can afford.—I am, &c., C. Tomlinson.

King's College, London.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Asiatic, 3.
Tues. ...Statistical, 8. 1. Col. W. H. Sykes, M.P., F.R.S., "Statistics of Aberdeen." 2. Mr. J. Michell, "Crime in Russia."
Ethnological, 8. 1. Mr. H. Christy, "Notice on some of the Pre-historic Cave-dwellers of Southern France." 2. Mr. John Crawfurd, "On the Supposed Infecundity of Human Hybrids or Crosses."
Wed.... Geological, 8.
R. Society of Literature, 8½.
Thur. ...R. Society Club, 6. Annual Meeting.

PARLIAMENTARY REPORTS.

Delivered on May 21, and 23, 1864.

Par. Numb.
303. Civil Bill Court (Carrickfergus)—Memorial.
306. Ordnance Survey—Return.
307. Army (Medical Department)—Returns.
245. Daunt's Rock—Correspondence.
253. Copper, &c.—Return.
287. Hops—Returns.
308. Army (Reserve Force)—Warrant.
315. Parliamentary Deposits (1864)—Return.
317. Military Reserve Funds—Account.
319. Street Music (Metropolis)—Instructions.
113. Bill—Highways Act Amendment.

Delivered on 24th, 25th, and 26th May, 1864.

248. East India (Godavery River)—Correspondence, &c.
295. Museum of Industry (Dublin)—Returns.
299. Royal Dublin Society, &c.—Instructions.
302. Royal Hibernian Military School (Dublin)—Return.
62 IV. Committee of Selection—Fifth Report.
326. New Zealand—Correspondence.
267. Established Church, &c. (Ireland)—Returns.
277. Exchequer—Account.
328. Court of Chancery (Ireland)—Returns.
104. Bills—Inns of Court.
95. ,, Administration of Trusts—(Scotland)
114. ,, Government annuities (amended).
115. ,, Bank of England Notes (Scotland).
112. ,, County Voters Registration.
116. ,, Game (Ireland).
Public General Acts—Caps. 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20.

Patents.

From Commissioners of Patents Journal, June 10th.

Grants of Provisional Protection.

Alkali, obtaining sulphur from—1296—B. Jones.
Animal charcoal, reburning of—1038—J. F. Brinjes.
Bituminous substances, treatment of—1349—J. Young.
Boots and shoes, pegs and rivets for—968—A. W. Smith.
Bottle holders—1313—H. M. Harwood and G. Whitford.
Bottle-washing machine—1321—W. Hart.
Bridges, girders for—1302—J. E. Whiting.
Candle lamps, self-extinguishing—785—S. Trotman.
Carding engines—1267—W. R. Harris.
Cheques, &c., prevention of fraud by altering—1355—R. E. Donovan and R. Bowles.
Clavicord instruments—1365—A. V. Newton.
Cocks, taps, or valves, high-pressure—1307—H. Redfern.
Crinoline fasteners—1363—L. Kinnings, G. Gibbs, & W. T. Edwards.
Doors, attaching knobs, &c., to—1287—J. L. and J. Hinks.
Dress fastening—1299—W. Law.
Edging or trimming, festooned—1294—W. Clark.
Electric telegraphs—1303—G. Schaub.
Engines, heating the steam boilers of—1300—G. Shaw.
Engines worked by heated air, &c.—1291—M. P. W. Boulton.
Fabrics, measuring and blocking—1279—J. Belham and G. Valentine.
Fibrous substances, machinery for opening—1329—M. Curtis.
Fire-arms, breech-loading—1269—J. Frazier.
Floating bodies, sounding a bell applied to—1341—G. Herbert and R. Stainbank.
Floor cloths, &c., printing—1289—W. Howlett.
Fluids, drawing off and regulating the flow of—1293—J. Adams.
Gullies, sinks, &c., trap for—865—J. F. Sharp.
Hatching eggs and rearing birds artificially—1280—C. Minasi.
Hoops, &c., reducing the circumference of—1347—R. A. Brooman.
Horse shoes—1283—J. Fowler, jun.
Iron and steel iron, machinery for puddling—1315—J. Eastwood.
Iron and steel, puddling of—1317—G. A. C. Bremme.
Languages, apparatus to facilitate the acquisition of—1359—A. Long.
Looms—1353—J. Platt and E. Hartley.
Oils, manufacture and purification of—1319—A. Wall.
Organs, &c., played with finger keys—1292—J. W. Goundry.
Paint—1327—J. Thomas.
Projectiles, fuses for—1278—W. E. Newton.
Railway chairs, &c.—1305—R. Holiday.
Railway turntables—1333—C. Greenway.
Railways, turntables applicable to—1297—G. Moulton.
Screw propeller—1215—R. A. Brooman.
Shafts and axles, communicating rotary motion to—1265—F. Deletang.
Steam boilers, cleaning and preventing deposits in—1325—J. W. Lees.
Steam carriages for common roads—1351—J. Fowler and T. Webb.
Steam engines, &c.—1339—J. Huggett.
Studs, buttons, &c.—1309—L. A. W. Lund.
Tables—1337—W. Halse.
Theatrical effects, apparatus for obtaining—1179—A. Silvester.
Thrashing machines, combined—1277—W. Tasker.
Tools, handle or stock for—1295—P. Ross.
Vegetable and animal matters, preservation of—299—J. Young.
Vegetable fibres, separating and cleansing—1323—J. B. Fuller.
Vessels, propellors for—1304—H. Wimshurst.
Wire, testing the strength of—1345—P. Deeley.

Invention with Complete Specification Filed.

Typographical composing machine—1403—W. E. Gedge.

Patents Sealed.

3049. W. Williamson.
3161. H. B. Sears.
3164. L. Nobel.
3165. W. W. Box.
3175. J. Hindle, W. F. Calvert, and E. Thornton.
3201. W. Norton.
3235. J. G. Rowe.
3280. W. Clark.
743. B. P. G. de Thorey.
752. S. Matthews.

From Commissioners of Patents Journal, June 14th.

Patents Sealed.

3172. J. M. Bryden.
3178. R. A. Brooman.
3179. T. A. Blakely.
3182. J. B. Fell.
3193. T. Hyatt.
3203. T. Goldie.
3205. F. W. Collins.
3206. W. E. Gedge.
3207. G. Haseltine.
3208. F. N. Gisborne.
3211. C. T. Judkins.
3212. J. Howden.
3216. W. Clark and W. F. Batho.
3218. R. H. Taylor.
3219. R. Paterson.
3221. R. Baynes.
32_3. J. Green.
3224. E. J. Green and R. Mason.
3225. J. Eastwood.
3242. J. H. Johnson.
3251. G. T. Bousfield.
3252. F. Walton.
3256. J. H. Johnson.
5. W. Clark.
6. W. Muir.
11. H. A. Bonneville.
12. H. A. Bonneville.
14. W. Clark.
20. J. Askew.
96. T. English.
224. P. Christie.
225. J. H. Johnson.
227. J. Young and A. C. Kirk.
267. J. G. Jones.
292. H. E. Drayson.
365. I. Dimock.
476. G. Parry.
503. J. W. Swan.

Patents on which the Stamp Duty of £50 has been Paid.

1441. J. Vaughan.
1452. C. W. Lancaster.
1458. J. M. Worrall and T. Lawrence.
1473. A. Brown.
1482. M. Hawdon.
1486. M. Henry.
1487. F. E. Schneider.
1548. T. Routledge.
1496. S. B. Singer.
1507. J. Watt.
1553. A. R. Le Mire de Normandy.
1571. T. T. Jopling.
1499. W. H. Walker.
1524. B. Blackburn.
1555. J. Miller and H. E. Skinne
1582. J. Cullen.

Patents on which the Stamp Duty of £100 has been paid.

1605. W. Wright.
1629. J. Robertson.
1655. E. Barsanti and F. Matteucci.
1641. J. L. Clark.
1682. J. Fowler, jun., and W. Worby.
1684. J. Fowler, jun., R. Burton, and T. Clarke.
1645. J. Whitworth.
1651. E. Brasier.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, JUNE 24, 1864. [No. 605. VOL. XII.

STATEMENT OF RECEIPTS, PAYMENTS, AND EXPENDITURE FOR THE YEAR ENDING 31ST MAY, 1864.

RECEIPTS AND PAYMENTS.

Dr.

	£	s.	d.	£	s.	d.
To cash balance in hands of Coutts and Co., 30th May, 1863				965	2	4
To Annual Subscriptions				5,749	0	3
To Life Contributions				547	1	0
To Dividends on Stock:—						
£6,530 18s., Consols	190	4	4			
£388 1s 4d., New 3 per Cent.	11	6	2			
52,000 Rupees Indian 5 per Cent. Rupee Paper	256	12	11			
				458	3	5
To Examination Prize Fund:—						
Her Majesty the Queen, the Prince Consort's Prize	26	5	0			
Sir C. Wentworth Dilke, Bart.	10	0	0			
Rev. Dr. Temple	10	10	0			
Harry Chester, Esq.	4	0	0			
Charles Brooke, Esq., F.R.S.	2	2	0			
Dr. Skey	1	1	0			
				53	18	0
To Wood-Carving Prizes by the Society of Wood Carvers				12	0	0
Labourers' Cottage Prize, by J. B. Denton, Esq.				25	0	0
Sale of Transactions				0	10	0
" Jury Reports				181	13	0
Prince Consort's Memorial Fund				43	10	6
South Australian Institute				350	0	0
Second Residue of Dr. Cantor's Estate				1	3	9
Sale of Art-Workmanship Examples				26	11	2
Examination Fees				5	6	5
				£8,418	19	10

Cr.

	£	s.	d.	£	s.	d.
By overpaid on cash account, last year repaid	0	11	0			
" " Petty Cash do.	1	9	8			
				2	0	8
Rent, Rates, and Taxes				193	13	9
Insurance, gas, coal, and house charges				153	6	9
Salaries, wages, and commissions				1,713	1	1
Postage, Stamps, and Parcels				136	17	5
Stationery and Printing				263	2	3
Advertising				9	12	6
Conversazione				155	13	8
Society's Annual Dinner				21	8	0
Library, Bookbinding, &c.				56	16	4
Journal, including Stamps and Distribution to Members				1,144	15	2
Union of Institutions, including Examinations, Prizes, Postage, Stationery, Printing, &c.				535	4	10
Artistic Copyright				0	1	9
Microscopes				5	1	5
Repairs and Alterations on Renewal of Lease				1,561	19	1
Jury Reports on Exhibition of 1862				1,006	6	9
South Australian Institute				429	3	0
Prince Consort's Prize				26	5	0
Wood Carving Prizes				49	1	8
Art-Workmanship Prizes				70	14	4
Working Classes Museum				0	5	1
Charges Special to General Committees				145	0	0
Annuity to Mrs. Cantor				25	0	0
Cantor Lectures				193	9	4
Memorial Bust of the Prince Consort				106	10	6
Designs for the Albert Memorial Medal				52	14	0
Premium List				122	15	1
Labourers' Cottages Competition				9	10	6
Coutts and Co. (loss on exchange)				0	0	3
				£8,189	10	2
Balance in hands of Coutts and Co., 31st May				229	9	8
				£8,418	19	10

LIABILITIES AND ASSETS.

Dr.

	£	s.	d.
To Sundry Creditors:—			
South Australian Institute	12	4	8
Working Classes Museum	80	14	1
Sir W. C. Trevelyan, Bart.	70	0	0
Jury Reports on Exhibition of 1862	1301	0	4
Society's Memorial to the Prince Consort	546	0	6
Maitland School of Arts	0	11	3
Labourers' Cottage Prize	25	0	0
Prince Consort's Prize	26	5	0
Examination Prizes	191	0	0
Examiners' Fees	204	15	0
Swiney Prize	100	0	0
Art Workmanship Prizes	88	0	0
Repairs and Alterations	955	9	0
Tradesmen's Accounts	717	9	2
	4,318	9	0
Excess of Assets over Liabilities	4,931	16	1
	£9,250	5	1

Cr.

	£	s.	d.	£	s.	d.
By Consols, £1,930 18s. at 91¾				1,771	13	9
By Invested in India 5 per cent. Rupee Paper				355	2	7
By Subscriptions in course of collection £2,019 3s., valued at				1,600	0	0
Value of the Society's lease of Premises				3,000	0	0
" " Other Property				2,000	0	0
By Examination Prize Fund	40	5	0			
" " Fees	5	0	0			
				45	5	0
By Jury Reports per Messrs. Bell and Daldy				178	14	1
By Cash in hands of—						
Coutts and Co.	229	9	8			
London and Westminster Bank	70	0	0			
				299	9	8
				£9,250	5	1

TRUST FUNDS.

	£	s.	d.	
Swiney Bequest	£4,500	0	0	Consols.
John Stock's Trust	100	0	0	"
Fothergill's Trust	388	1	4	New 3 per Cents.
Cantor Bequest	5,049	9	7	Invested in India 5 per cent. Rupee paper.

Society's House, Adelphi, June 15th, 1864.

GEORGE S. LEFEVRE, *Auditor.*
P. LE NEVE FOSTER, *Secretary.*

Financial Statement.

The foregoing statement is published in this week's *Journal,* in accordance with Sec. 42 of the Society's Bye-laws, which provides that, at the Annual Meeting, "the Council shall render to the Society a full account of their proceedings, and of the receipts, payments, and expenditure during the past year; and a copy of such statement shall be published in the *Journal* of the Society, on the Friday before such General Meeting.

Annual General Meeting.

The One Hundred-and-Tenth Annual General Meeting, for the purpose of receiving the Council's Report and the Treasurers' Statement of the Receipts, Payments, and Expenditure during the past year, and also for the Election of Officers, will be held (in accordance with the Bye-laws), on Wednesday, the 29th June, at 4 o'clock, p.m. At this meeting a new Trustee of the Soane Museum will be elected, pursuant to the Act, 3 William IV., cap. 4.

The Council hereby convene a Special General Meeting of the members of the Society, to ballot for members, such meeting to take place at the close of the Annual General Meeting.

By order,

P. Le Neve Foster, Secretary.

Society's House, Adelphi, June 22, 1864.

Examinations.

The Council having been informed that John Dingwall, of the Evening Classes, Andersonian University, Glasgow, to whom had been awarded the 2nd prize of £3 in Freehand Drawing, is or has been a teacher, and is therefore disqualified, have now awarded this prize to No. 335, Alexander Archibald, aged 21, Glasgow Institution, house painter.

The Council beg to draw the attention of candidates to the importance of distinctly stating in every case whether they are disqualified for competing for the prizes. The disqualifications are distinctly stated in the programme, and the candidate omitting to state them when they exist cannot be said to act fairly towards his fellow-candidates. Secretaries of Local Boards should, before signing a candidate's "Form 4," make strict inquirie whether he is in any way disqualified for a prize.

Proceedings of the Society.

Thirteenth Annual Conference.

The Thirteenth Annual Conference of the Representatives of the Institutions in Union, and the Local Educational Boards, with the Council of the Society, was held at the Society's House, on Thursday, the 16th inst., at 12 o'clock noon. William Hawes, Esq., Chairman of the Council, presided.

The following is a list of the Institutions and Local Educational Boards represented at the Conference, with the names of their respective representatives:—

Ashton & Dukinfield Mechanics' Institution and Local Board	Mr. Hugh Mason, President.
Banbury Mechanics' Institution and Local Board	Mr. J. H. Beale.
Basingstoke Mechanics' Institution	Mr. G. Sclater-Booth, M.P.
Battle Mechanics' Institution	Mr. Horace Martin.
Bucks and Berks Adult Education Society	Rev. C. D. Goldie. Rev. Thomas Rooke.
Bury (Lanc.) Athenæum	Rev. C. F. Hildyard, President.
Carlisle Mechanics' Institute	Mr. Wilfrid Lawson, M.P. Mr. Edmund Potter, M.P.
Chatham, Rochester, &c., Mechanics' Institute and Local Board	Mr. H. G. Adams. Mr. Frederick Butler.
Chelmsford Literary and Mechanics' Institution	Mr. Thomas Moss.
Crewe Mechanics' Institution	Mr. W. J. Bullock. Mr. George Lord.
Devonport Mechanics' Institute and Local Board	Mr. William Mogg. Mr. W. Mogg, Jun.
Dover Museum & Philosophical Institution	Mr. Thomas Lewis. Mr. Benjamin Linds.
Dudley Mechanics' Institution	Mr. John Finch. Mr. Joseph Stokes.
Faversham Institute	Mr. F. W. Monk.
Gilford (Ireland) Young Men's Mutual Improvement Society.	Mr. H. R. Masaroon.
Glasgow Institution	Mr. Alexander Craig.
" " Local Board.	Mr. Robert Dalglish, M.P.
Gosport and Alverstoke Literary and Scientific Institution	Mr. Walter O. Field.
Hastings Mechanics' Institute	Mr. C. Womersley.
Hereford Permanent Library	Mr. William Aston, President.
Hertford Literary and Scientific Institution	Mr. John Lyon Foster.
Hitchin Mechanics' Institution	Mr. Joseph Pollard.
Kinver Young Men's Improvement Association and Local Board	Mr. Thomas Bolton.
Lancashire and Cheshire Association Mechanics' Institutions	Mr. Councillor Rumney Dr. Pankhurst. Dr. John Watts. Mr. Lawton.
Leeds Mechanics' Institute	Mr. Edward Baines, M.P.
Lichfield Free Library	Captain Dyott.
Llanelly Mechanics' Institution.	Mr. R. T. Howell.
London, Bank of England Library and Literary Association	Mr. John Coe.
" City of London College and Local Board	Rev. Richard Whittington. Mr. F. Reynolds.
" Clapham Local Board	Rev. W. H. W. A. Bowyer. Mr. E. Heller.
" Greville House (Paddington) Library and Reading-room	Mr. James Stebbings.
" Lambeth Local Board	Rev. W. D. Green.
" Mechanics' Institution Local Board	Mr. T. A. Reed.
" Metropolitan Association for promoting the Education of Adults	Mr. H. H. Sales.
" Marylebone Literary & Scientific Institution	Mr. W. H. Aylen. Mr. T. Corbitt. Mr. J. Swinburne. Mr. T. Williams.

London, Sherwood Mutual Improvement Society (Battersea)	Mr. George Bell. Mr. Thos. Hellyer.
" Walworth Literary and Scientific Institution	Mr. J. S. Noldwritt.
" Westminster, Duck-lane Working-men's Club	Mr. E. Stephens.
Manchester Mechanics' Institution and Local Board..................	Dr. Fairbairn, F.R.S. Dr. Pankhurst. Mr. Councillor Rumney Mr. E. S. Rogers.
Newport (Mon.) Athenæum ...	Sir Thomas Phillips, F.G.S.
Nottingham Mechanics' Institution	Mr. Charles Paget, M.P.
Oldham Lyceum	Mr. J. G. Blackburne, President. Mr. J. T. Hibbert, M.P.
Smethwick, Messrs. Chance's Library	Mr. F. Talbot.
Southampton, Hartley Institution	Dr. Francis T. Bond.
South Staffordshire Association	Lord Lyttelton. Mr. John Jones.
Southern Counties Adult Education Society	Hon. and Rev. Samuel Best.
Stockport Mechanics' Institution	Mr. S. Robinson.
Swindon Mechanics' Institution.	Mr. J. H. Preece.
Whitby Institute	Mr. Edwin Cockburn.
Wolverhampton Working Men's College	Mr. Henry Beckett.
Yorkshire Union of Mechanics' Institutes	Mr. Barnett Blake.

The Secretary read the following

Report to the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce.

Gentlemen,—I have the honour to lay before you my report of the proceedings in connection with the Union of Institutions since the last Conference. In the first place, it is gratifying to have to record the success of one of the prizemen of last year, Mr. George M. Norris, of the City of London College, who has, after a competitive examination, obtained an assistant clerkship in the Privy Council, the nomination to compete being given to the Society by Earl Granville, one of the Vice-Presidents, who has again so kindly taken an active interest in this branch of the Society's operations.

The Examinations of the Society have this year been conducted on precisely the same system as on former occasions, and that is now so well understood that it is needless to repeat what was told in my last year's report. It is satisfactory to know that the numbers attending the Society's Examinations have gradually increased every year, and have never gone back. The number this year attending the Final Examination is 1,068, as compared with 956 last year, showing an increase of 112. These examinations were carried on at 87 Local Educational Boards, who returned 1,197 as fitted to undergo the Final Examination, but of whom 1,068, as I have before said, actually worked papers. The number of papers worked by them has been 1,540, as against 1,360 last year, and the certificates gained have been in all 1,222, thus distributed:—First class, 236; second class, 479; third class, 507; whilst the corresponding numbers last year were 1,079, 228, 429, and 442. The number of papers in respect to which no certificates have been awarded this year is 318, as against 261 last year.

The table No. II. (page 527) will show the manner in which the subjects of examination have been distributed among the candidates.

The number of prizes awarded this year is somewhat increased, there being 55 on the present occasion as against 51 last year.

The Prize of 25 guineas, established by His Royal Highness the Prince Consort, and graciously continued by Her Majesty the Queen, to be offered annually to the candidate who, obtaining a certificate of the first class in the current year, shall have obtained in that year and the three years immediately preceding it, the greatest number of such certificates, has this year been gained by Mr. John Allan, aged 25, of the Glasgow Athenæum, an assistant surveyor, who has during the four years obtained the following first-class certificates:—

1861—Logic and Mental Science, with 1st Prize.
1862—English History, with 1st Prize; and English Literature, with 2nd Prize.
1863—Arithmetic, with 1st Prize; Book-keeping, with 1st Prize; and Geography, with 2nd Prize.
1864—Magnetism, Electricity, and Heat, with 2nd Prize; Domestic Economy, with 1st Prize; and Animal Physiology, with 2nd Prize.

The whole amount of prizes gained this year is £217 5s., being a small increase on that of last year, when the amount was £205 5s. In the appendix to my report will be found the remarks of the Examiners on the general character of the Examinations for the year. The return (table IV., page 529), shows the occupations—actual or intended—of the various candidates from whom return papers were received as intending to take advantage of the Society's Examinations this year, and of these 1,068 actually attended them.

It will be remembered that from the first it was suggested that the Local Boards, in addition to the duties undertaken by them in conducting the Society's Final Examination, might with advantage hold local Examinations, and grant certificates and prizes to candidates junior in age to those admitted to the Society's Examinations or not sufficiently prepared to take the papers set at those Examinations. Several Boards and Unions of Institutions carried out this suggestion; but after a time it was found that it would be extremely desirable, and add much to the value of these local Examinations, if some plan could be adopted by which a uniform character might be given to them—some uniform standard adopted, which would render the certi-

ficates given by one Board of equal value with those given by another. With this object in view a Committee was formed, called the Central Committee of Educational Unions, in which every Union was represented by one or more delegates, and the Society of Arts by four members of its Council. The duty of the Committee was to draw up a uniform scheme for the Elementary Examinations, and prepare annually a set of Examination papers to be used by such of the Unions or Boards as might choose to adopt them. In addition a form of Certificate was drawn up for the adoption of all. By this means each Board conducted its own Examination upon the same papers, at the same time and on the same principles as the others associated with it; and as one scale of marks was laid down to be used, a uniform standard was practically obtained, and thus certificates issued by each Board represented, with a very fair amount of uniformity, the results of the Examinations in all. This system of papers and certificates was adopted by several Unions and Local Boards and acted upon, but the anomalous position and constitution of the Committee led to considerable misunderstanding as to its connection with the Society of Arts, and as to how far the Society was responsible for its action. While the Central Committee was in reality a body totally separate and independent of the Society of Arts, yet its working was so intimately connected with it that the Society was on all sides believed to be responsible for all that was done in its name. It therefore became a matter of serious consideration how far it was right that such a state of things should continue, and after consultation with some of the leading members of Unions and Local Boards, the Council of the Society resolved to appoint an Educational Committee, including representatives from the various Local Unions, which should have charge of conducting the work hitherto performed by the Central Committee, and at the same time advise the Council on any matters connected with the Union of Institutions for which its constitution would especially qualify it. This Committee has now been formed, and has commenced its work by preparing the programme of the Elementary Examinations for next year.

The Elementary Examinations have, however, this year been conducted under the arrangements made by the Central Committee. No material alteration was made in the programme of these Examinations, and the Candidates' papers were looked over and the Certificates awarded, as in former years, by the local Examiners connected with the District Unions. In order, however, to render the uniformity—already to a large extent secured by the use of the same sets of papers at the various centres—as perfect as possible, special copies of the papers were printed for the use of the Examiners, with the number of marks to be awarded for a complete answer to each question printed opposite to it, and it is believed that this arrangement will contribute materially to render the Certificates awarded by the various local authorities as nearly as possible of the same value all over the country. There is an increase in the number of centres at which these Examinations were held, as well as in the number of Candidates, as compared with the last year, but the Candidates are still hardly so numerous as might have been expected considering the great importance of promoting Elementary Education, and it is hoped that when these Examinations are conducted with papers prepared, as will be the case next year, by the Education Committee of the Society (the constitution of which I have already explained), the advantages offered by these Elementary Examinations will be more extensively appreciated. Last year these Examinations were held, under the auspices of seven District-Unions, at 58 centres; this year ten Unions have held them at 104 centres. In 1863 there were 180 senior (or higher grade) candidates, of whom 96 passed; and 631 junior (or lower grade) candidates, of whom 284 passed; this year there have been 435 higher grade and 1,360 lower grade candidates, of whom 170 and 707 respectively obtained certificates. It will be seen by the tabular statement (see page 525) that among the senior candidates were 24 females, and among the junior no less than 171.

It had long been the desire of the Institutions that if possible much more intimate connection should exist between them and the Society, and at the last Conference a resolution was passed requesting the Society to employ an officer or officers, who might visit the Institutions from time to time, and keep up constant communications between them and the Society, representing the Society at the annual meetings of the Institutions, and on other suitable occasions. The Council have frequently had this matter under their serious consideration, but hitherto various difficulties have stood in the way of arrangements for this purpose. The Council, however, though unable to undertake a scheme for visiting every Institution in Union, have felt the importance of taking some steps in this direction, which would, to some extent, effect the object in view. Most of the existing District-Unions employ a paid visiting officer to visit their Institutions, and this system the Council consider must by no means be superseded by the Society; but the Council have proposed, and the proposal has met with the concurrence of the District-Unions, that the Society of Arts shall appoint, as its own visiting officers, the visiting officers of those District-Unions which desire this kind of co-operation, and remunerate

	Number of Centres.	Senior Male Candidates.		Senior Female Candidates.		Junior Male Candidates.		Junior Female Candidates.	
		Examined.	Passed.	Examined.	Passed.	Examined.	Passed.	Examined.	Passed.
Aldershot and Farnham District	1	2	2	...	...	21	18	...	...
Edinburgh (Philosophical Institution)	1	6	6	...	...	...	...	...	...
Hertford	5	4	2	...	...	12	7	6	3
Lancashire and Cheshire Union	14	126	18	5	1	168	49	5	2
London (Metropolitan Association)	11	73	24	9	5	376	229	81	41
Southern Counties Adult Educational Society	37	56	27	...	...	234	80	20	7
South Staffordshire Association	8	46	20	...	...	123	67	...	...
Waterford	1	5	4	...	...	15	5	...	...
Worcestershire Union	6	8	2	...	...	28	8	...	...
Yorkshire (West Riding Educational Board)	20	85	51	10	8	212	143	59	48
TOTALS	104	411	156	24	14	1,189	606	171	101

them for their services to the Society by paying to each of them a sum equal to one-fourth of the Society's receipts from the Institutions within the limits of his district. It will thus be understood that any Institution in Union with the Society of Arts, within the district of a Provincial Union, will be able to obtain, at suitable times, the services of the Visiting Officer. This arrangement will at once come into operation, and it is confidently hoped that it will be productive of benefit.

I am, Gentlemen,
Your obedient servant,
P. LE NEVE FOSTER, *Secretary*.

APPENDIX.

EXAMINERS' REMARKS.

The Examiner in *Arithmetic* says:—"The papers of this year show evident traces of intelligence and judgment. The writing out is, in general, neatly done, the figures are well-made, and the work, as a whole, quite equal to that of last year. Some exceptions must, however, be made to this favourable opinion."

The Examiner in *Book keeping* says:—"The number of candidates this year is the largest that has yet presented itself in this subject. The average character of the papers is decidedly good, while some of those in the first class exhibit a high degree of excellence, and, in certain instances, the quality of each is so nearly equal as to have required much consideration in order to determine the number of marks which indicate their relative merits."

The Examiner in *Algebra* says:—"Some of the candidates have answered very creditably, and evinced praiseworthy accuracy in their work. On the whole, the results of the examination may be considered satisfactory, but in some cases the candidates who have failed appear to me to have been premature in presenting themselves for examination."

The Examiner in *Geometry* says:—"Many of the papers show that there has been an intelligent apprehension of geometrical methods. Some are deficient for want of instruction, *e.g.* cases where propositions are fairly proved but the constructions omitted. I could not but think that some of these papers would have received high marks if the candidate had been aware of the absolute necessity of clearly indicating the construction."

The Examiner in *Mensuration* remarks:—"There has been an improvement upon last year's work. I should like to see a more general knowledge of the Elements of Geometry made the foundation of Mensuration; in many instances the candidates have nothing to rely upon but an exact recollection of their rules. The answers to a simple question on the relation between French and English units of measure seem to show that an acquaintance with the metrical system is not very extensively diffused among the class under examination."

The Examiner in *Trigonometry* says:—"The quality of the candidates' work is decidedly inferior to that of last year. The quantity of work done is less—and no great ability has been shown by any one candidate."

The Examiner in *Conic Sections* says:—"I regret that only one candidate has answered questions in this subject this year. The work of that one candidate is good and deserves reward."

The Examiner in *Navigation and Nautical Astronomy* says:—"These subjects still create little interest: this is perhaps natural considering their highly technical nature. The candidates have shown more accuracy in the use of the tables and in taking out quantities from the Nautical Almanac than last year. Candidates would do well to recollect that generally the questions are arranged in the sections according to their difficulty. I have been disappointed in finding in the questions requiring numerical solutions a preference given almost exclusively to the easier classes of problems; this will account for none of the candidates having a first class certificate awarded."

The Examiner in the *Principles of Mechanics* says:—"After a careful examination of the papers I am led to entertain a hope that the remarks which I made last year have produced a salutary effect. I have been much gratified by the evidence of that perspicuity and method to which I recently directed attention; and I believe that I am not mistaken in the impression that I have formed, which is, that a higher class of mathematical and mechanical instruction is becoming familiar to the young men of our Mechanics' Institutes and Evening Schools."

The Examiner in *Practical Mechanics* says:—"On the present occasion the candidates have exhibited a fair average degree of merit, and there is nothing that calls for any particular remark."

The Examiner in *Electricity, Magnetism, and Heat* regrets to observe that on the present occasion the accuracy of knowledge evinced scarcely comes up to the standard of past years.

The Examiner in *Astronomy* says:—"The papers this year are totally different in character from those of previous years. They are of a much higher class, and evidently the result of much more study. The want of

TABLE I.—Results of the Examination of 1864.

NAME OF LOCAL BOARD.	No. of Candidates Examined at Previous Examination by Local Board.	No. of Candidates who Passed Previous Examination by Local Board.	No. of Candidates Examined at Final Examination.	No. of Candidates who passed at Final Examination.	No. of Papers Worked at Final Examination.	No. of First-class Certificates awarded.	No. of Second-class Certificates awarded.	No. of Third-class Certificates awarded.	No. of Prizes awarded to Candidates.	No. of Unsuccessful Candidates.
Aberdeen	24	20	23	21	28	3	12	10	...	2
Aldershot and Farnham	4	4	7	4	13	1	4	4	...	3
Ashford	...	...	1	1	1	...	1	...	...	...
Ashton-under-Lyne	3	3	2	2	8	...	3	4	...	...
Bacup	8	8	14	11	24	2	5	11	...	3
Banbridge (Ireland)	10	10	9	7	16	2	5	5	...	2
Banbury	6	6	7	5	7	1	3	1	...	2
Barnet	2	1	2	2	3	...	1	1	...	...
Belfast	4	4	6	5	9	1	1	5	...	1
Birmingham and Midland	18	18	20	19	22	4	13	4	...	1
Blackburn and Clitheroe	11	11	19	1	19	...	...	1	...	18
Bolton	27	10	7	3	8	...	1	2	...	4
Bradford	21	18	24	21	47	5	16	20	2	3
Bristol	26	24	20	16	24	2	10	6	...	4
Bury St Edmund's	2	2	1	1	2	...	...	1	...	...
Canterbury	...	...	1	1	1	1	...	...	...	...
Carlisle Mechanics' Inst.	4	4	5	4	9	1	3	3	...	1
Chatham, Rochester, Strood, and Brompton.	1	1	1	1	2	1	1	...	1	...
Chelmsford	3	3	4	4	5	3	...	2	...	...
Crewe	12	11	5	3	9	...	1	2	...	2
Darlington...	4	4	4	4	5	1	3	1	...	...
Deptford	18	14	18	14	24	1	2	15	...	4
Derby	2	2	2	2	3	3	...	...	...	...
Devonport...	16	15	22	22	43	9	16	14	3	...
Edinburgh...	7	7	6	6	10	...	3	6	...	...
Faversham	6	6	7	5	8	1	2	3	...	2
Gilford (Ireland)	4	4	7	6	13	3	3	3	...	1
Glasgow (Athenæum)	52	50	42	38	50	19	17	9	7	4
Glasgow (Institution)	39	33	32	23	39	4	15	10	...	9
Glasgow (Mechanics' Institution) ...	41	38	42	34	56	7	19	21	3	8
Glasgow (Popular Evening Classes, Andersonian University)	42	37	37	28	44	7	14	12	3	9
Gosport and Alverstoke (Literary and Scientific Institution)	...	...	2	2	6	...	3	2	...	...
Halifax (Working Men's College) ...	28	14	23	23	29	2	8	17	...	...
Hertford	1	1	3	3	5	...	4	1	...	...
Hitchin	2	2	2	2	3	...	2	...	...	...
Hull	9	9	9	9	11	5	4	2	1	...
Hyde (with Hatherlow)	10	10	6	4	6	1	1	2	...	2
Ipswich	14	13	17	17	20	6	8	5	...	...
Lancashire (East) Union (Burnley) ...	38	36	37	32	65	6	14	28	3	5
,, ,, ,, (Haslingden) ...	12	12	12	9	24	...	2	9	...	3
,, ,, ,, (Rawtenstall) ...	10	10	10	6	14	...	1	8	...	4
Leeds (West Riding Union of Institutions) ...	19	17	23	21	41	5	11	17	2	2
,, (Young Men's Christian Association)...	27	27	26	24	38	4	14	15	...	2
Leicester (Church of England Institute) ...	3	3	5	5	6	2	2	2	...	...
Lichfield	12	6	8	7	10	2	2	4	1	1
Liverpool	13	12	13	9	27	3	8	5	...	4
London (City of London College) ...	60	54	69	68	112	36	45	23	11	1
,, (Royal Polytechnic Institution) ...	13	13	12	11	16	5	6	2	...	1
London Met. Assoc. (London M.I.) ...	8	5	14	14	29	9	15	3	4	...
,, ,, (Pimlico)	...	...	1	1	2	...	1	1	...	...
,, ,, (St. Stephen's, Westm.)	2	2	7	6	9	1	4	2	...	1
,, ,, (Stepney Deanery) ...	27	14	15	11	23	2	6	8	...	4
Louth	5	5	4	4	6	...	3	3	...	...
Macclesfield	23	19	19	11	23	3	3	7	...	8
Manchester	70	59	63	55	94	19	27	32	4	8
Mossley	9	6	6	6	6	...	5	1	...	...
Newcastle-on-Tyne (Church of Eng. Inst.)	5	4	4	4	8	...	1	4	...	..
,, ,, (Mech. Inst.) ...	17	17	15	13	17	1	3	11	1	2
Oldham (Lyceum)	24	16	15	13	20	1	6	8	1	2
,, (Science School)	27	26	34	25	34	5	13	7	2	9
Paisley	16	15	14	9	14	2	2	5	...	5
Pembroke Dock	9	9	10	10	20	3	9	6	1	...
Peterborough	2	2	2	2	5	1	1	1	...	...
Portsmouth	1	1	1	1	3	1	2	...	...	..
Richmond...	...	...	1	1	1	1	...	...	1	...
Rotherham	...	...	1	1	1	1	...	...	...	...
Salford	38	31	39	32	51	2	16	21	...	7
Selby	1	1	1	1	1	...	1	...	...	...
Slough	5	5	12	6	14	1	2	5	...	6
Southampton	17	16	21	17	33	8	5	13	...	4
Southern Counties (Adult Educational Society)	1	1	1	1	2	...	...	2	...	...
South Staffordshire Union (7 centres) ...	43	40	63	56	88	14	29	32	3	7
Wakefield	...	...	7	7	13	1	4	5	1	...
Worcestershire Union of Educational Institutions	...	...	1	1	3	...	2	1	...	...
York	8	8	8	3	9	1	3	...	...	5
Yorkshire Union (4 centres)	20	19	15	12	26	...	7	12	...	3
	1,066	928	1,068	889	1,540	236	479	507	55	179

TABLE II.—Number of Papers Worked in each Subject in the Four last Years; with the Result for the Year 1864.

SUBJECTS.	1861.	1862.	1863.	1864.				
				No. of Papers Worked.	No. of First-class Certificates.	No. of Second-class Certificates.	No. of Third-class Certificates.	No. of Papers in respect of which no Certificate was awarded.
Arithmetic	336	336	358	431	64	104	160	103
Book-keeping	134	169	182	210	75	106	29	...
Algebra	114	96	81	93	8	24	35	26
Geometry	17	26	40	35	1	9	13	12
Mensuration	43	44	42	50	3	14	21	12
Trigonometry	8	11	12	13	...	1	1	11
Conic Sections	4	2	2	1	1	...	...	...
Navigation, &c.	3	1	3	4	...	4	...	...
Principles of Mechanics... ...	12	16	11	8	...	3	4	1
Practical Mechanics	12	15	17	14	3	3	8	...
Magnetism, Electricity, &c. ...	18	8	21	22	2	6	6	8
Astronomy	4	5	3	4	1	1	1	1
Chemistry	36	37	81	99	6	30	49	14
Animal Physiology	5	40	16	42	6	9	7	20
Botany	5	9	3	8	1	3	1	3
Agriculture	1	1	1	4	1	1	2	...
Mining and Metallurgy... ...	7	17	16	11	2	2	2	5
Political and Social Economy ...	3	6	7	1	...	1	...	...
Domestic Economy	4	8	11	10	2	5	1	2
Geography	44	69	58	88	10	37	27	14
English History	46	80	71	89	7	33	38	11
English Literature	37	21	23	26	10	5	10	1
Logic and Mental Science ...	5	18	18	9	2	4	2	1
Latin and Roman History ...	22	20	16	21	2	9	7	3
French	79	80	88	77	9	16	30	22
German	5	17	18	26	4	15	6	1
Free-hand Drawing	40	28	74	50	5	6	23	16
Geometrical Drawing	5	14	55	66	6	20	16	24
Music	30	23	32	28	5	8	8	7
Totals	1,079	1,217	1,360	1,540	236	479	507	318

trigonometry, which I have previously pointed out, is very much lessened, and the total absence of practical application, of which I have had to complain, no longer exists. Every candidate—even the lowest—has worked some, and the highest has worked nearly all the practical questions correctly. Still, no one seemed to be aware of the necessity of interpolation between given places at certain times, to determine the place of an object at intermediate times, or at the time of observation, and, as far as I can infer, all were ignorant of the principle and practice of interpolation. I advise that attention be paid to interpolations, at least including second difference, and I still advise the careful study of geometry, particularly solid geometry, as well as plane and spherical trigonometry."

The Examiner in *Chemistry* says:—"The papers are, upon the whole, very creditable to the candidates and to their teachers. In justice to those candidates who receive third-class certificates I ought to explain that a great number of them have answered but a small proportion of questions. Their certificates are, in this manner, far more creditably earned than if the same number of marks had been obtained by less complete knowledge spread over a wider field."

The Examiner in *Animal Physiology* says:—"The higher papers this year are satisfactory; so also are most of those in the second class. Of the 20 unpassed papers, 13 exhibit frequent grammatical and orthographical errors; and the same papers display the greatest want of knowledge of the subjects examined upon. Can no near counsel reach such immature candidates, to restrain their attempts to obtain certificates so completely beyond their reach? I wish to mention that 14 of the successful candidates, and even three of those who are unsuccessful, have correctly indicated the chief points in the most approved method of attempting to recover a person apparently dead from drowning."

The Examiner in *Botany* says:—"I consider the result of the botanical examination satisfactory this time. Although but one paper ranks in the first class, a second paper comes well up and deserves some praise. It is to be noted that all the candidates (excepting one who has not passed) avoid a simple question in practical horticulture."

The Examiner in *Agriculture* reports an improvement in both the number and character of the papers which have been submitted to him on this subject. The questions asked were perhaps too numerous and too comprehensive for the time allowed to the competitors for their consideration of them; but the answers to many of them indicate a satisfactory acquaintance with the principles and details of farm practice.

The Examiner in *Mining and Metallurgy* says:—"None of the papers exhibit a degree of excellence worthy of special remark."

The Examiner in *Political and Social Economy* says:—"There is considerable talent and reading power, and knowledge of principle, in the one candidate, but he is

deficient in accurate knowledge of fact, as his answer to the question about the Bank of England shows."

The Examiner in *Domestic Economy* says:—"The papers sent in this year, both in the first and second class, are a considerable improvement upon those of last year."

The Examiner in *Geography* says:—"The number of papers examined this year is greater than on any former occasion. Their average merit is slightly below that of prior instances. This has perhaps arisen from insufficient regard to a condition specially stated in the programme, viz., the necessity of giving especial attention to the Australian and other colonies of Britain. Those who aim at high-class testimonials of geographical knowledge must study such topics with elaborate care and diligence, fortifying these studies by aid of maps, familiar exercise in the drawing of which will be found to constitute one of the most valuable aids towards the attainment of the desired result."

The Examiner in *English History* says:—"The answers to the questions on English History are, as a whole, very satisfactory, as regards both the amount of information displayed and the correctness of the composition. There can be no doubt that the great majority of the candidates have acquired a valuable knowledge of the leading events described in the text books which they use, and some practice in the selection and arrangement of facts. Some improvements may, however, still be made with advantage in their manner of preparing and using their materials. It is to be desired that they should learn to connect and compare various periods with one another, and to follow the history of institutions more continuously through successive stages of growth. They should also be warned against that habit of declamation and eloquent reflection which occupies time and space that might be employed to better advantage in a more careful recollection of facts during the limited time allowed for the examination. The first class would be considerably enlarged if the candidates would accustom themselves to answer questions on paper from time to time in the course of their reading, and to submit such answers for criticism and correction to those who superintend their studies."

The Examiner in *English Literature* says:—"I have never looked over the papers in this subject with more satisfaction than on this occasion. The candidates, with very few exceptions, have shown a remarkably sound acquaintance with the text of their authors. Many of them have quoted largely from Chaucer and Shakspeare, with aptness and accuracy. Those to whom I have been obliged to assign a low place in the table of marks have mostly fallen short less in the quality than in the quantity of their work. The only faults which I am inclined to notice are that some have indulged in needless circumlocution, in some cases repeating the phraseology of the questions; and that several of the best qualified candidates have shown a want of due acquaintance with the technicalities of grammar."

The Examiner in *Logic and Mental Science* says:—"At this year's examination there is some falling off in the numbers. In Logic the candidates have generally acquitted themselves well, though the papers on Morals and Psychology are for the most part rather meagre. With one exception the candidates seem to have read fairly for their subjects."

The Examiner in *Latin and Roman History* says:—"The best candidate answered in History remarkably well; two others fairly; the rest very little. The Latin is about the usual standard, except that the best did better than last year."

The Examiner in *French* says:—"On the whole the papers are rather below the average this year. It is true that the historical and literary questions have evidently been well prepared, and the answers are in general quite satisfactory; but the translations from English into French is throughout very incorrect, and, like the grammatical answers in the 3rd class papers, it betrays a general absence of that very method in learning, of that progressive and systematic study, which I conceive these examinations are intended to encourage. I would advise future candidates not to attempt in this way to jump, so to speak, over the elements of a language of which it may be said that whilst it is easy enough to acquire a superficial knowledge of it, there is nothing so difficult as to thoroughly master its spirit, at once so exact and so elastic."

The Examiner in *German* says:—"Not having seen the examination papers of former years, I had not the advantage of comparing the present year's papers and their merits with what has been accomplished by the candidates before. The remarks passed on the work last year seem to apply again with more or less force to the papers of this year. All the candidates, except only one or two, have exhibited very great skill in the first section of the paper; indeed, some translations are almost without any mistake or misunderstanding of the sense. The grammatical questions have, on the whole, been answered with considerable correctness. If the versions from English into German had been as good as the translations from German, the number of 1st class certificates would have been increased. As regards the essays, some of which read fluently, the points under consideration are not clearly set forth, and secondary ideas have taken the place of more important ones."

The Examiner in *Free-hand Drawing* says:—"I was surprised to find the subjects in the examination paper of this year should be found so difficult by many of the draughtsmen. From the gradual advance that was made in the previous years, I should have expected a greater number of creditable drawings from the living model than were produced by the candidates."

The Examiner in *Geometrical Drawing* says:—"The examination in this subject is better than the last, but there is still a general failure in the Solid Geometry, owing to a want of knowledge, both theoretical and practical, of that of the line and plane in space; this deficiency compels the candidate to employ awkward and circuitous constructions which admit of far easier and more accurate methods. One very elementary question, for want of this better training, was passed over by every candidate with one exception, and that one failed in it. The candidates frequently disregard the conditions, and give in constructions having no reference to the question before them. It is to be regretted that many seem rather to aim at quantity than quality in their work."

The Examiner in the *Theory of Music* says:—"On the whole the music papers are better on this than on any former occasion. Even among those "not passed" the answers, though few in number, often indicate careful teaching."

TABLE III.

This Table shows the ages of the 1,197 Candidates from whom return papers were received. Of these 1,068 underwent the Final Examination.

Age.	No. of Candidates.	Age.	No. of Candidates.
16	133	31	4
17	157	32	6
18	181	33	7
19	143	34	5
20	127	35	4
21	93	36	5
22	78	37	1
23	72	38	4
24	42	39	2
25	37	40	1
26	27	41	1
27	21	42	4
28	13	44	1
29	14	47	1
30	13		

TABLE IV.

OCCUPATIONS, PRESENT OR PROPOSED, OF THE 1,197 CANDIDATES FROM WHOM RETURN PAPERS WERE RECEIVED :—

Accountants (and Clerks)	8
Agent for Insurance Co.	1
Apprentices to Linen Manufacture	2
Architect (Assistant)	1
Architectural Draughtsman	1
Artist	1
Art-Pupil Teacher	1
Assistant, Corn Merchant's *	1
,, in Herbarium, Kew	1
,, in an Observatory	1
,, Registrar of Births, &c.	1
,, Royal Library, Windsor Castle	1
Auctioneer	1
Baker	1
Bell-hanger	1
Blacksmith	1
Bleacher	1
Boiler-maker	1
Book-keepers	25
Booksellers and Assistants	3
Boot-closer	1
,, maker	1
Bricklayers	3
Brick-makers	2
Builders	2
Butcher	1
,, and Cattle-dealer	1
Butler	1
Cabinet-makers	5
Card-maker	1
Carpenters	11
Cashiers	2
Caulker	1
Chemists (and Assistants)	24
,, and Druggists	5
Civil Engineers	3
Clerks (Banker's, Commercial, &c.)	314
,, Builder's	1
,, Builder's Surveyor's	1
,, Civil Service	3
,, Colliery	1
,, Corresponding	2
,, Customs'	3
,, Dock Office	1
,, in Education Office	1
,, Engineers'	3
,, Government	1
,, Insurance	6
,, Inland Revenue	1
,, Law, &c.	14
,, in Ordnance Survey Office	1
,, Post Office	2
,, in Probate Court	1
,, Railway	14
,, Ship-builder's	1
,, Surveyor's	1
Clog-maker	1
Cloth-dresser	1
,, finisher	1
,, looker	1
Clothier's Assistant	1
Coach body-maker	1
Coach Painters	2
,, Wheelwright	1
Coal dealer	1
Collectors	3
Colliery engine-driver	1
,, oversmen	2
,, studying the management of	2
Compositors	3
Computer in Ordnance Survey Office	1
Cooper	1
Core maker	1
Corrector (press)	1
Curriers	2
Customs' officer	1
Designers	3
Drapers	7
Draughtsmen	6
,, Engineering	1
,, Ordnance Survey	1
,, Ornamental	1
Drawer-in	1
Dresser	1
Dressing-case maker	1
Druggists, &c.	7
Drysalter	1
Dyers	2
Electro-plater	1
Engineers	46
,, Marine	1
,, Mining	2
Engine-fitters	3
,, Keepers	3
Engraver	1
,, to Calico Printer's	1
Factory operative	1
Farmers	2
Fitters	6
,, and turner	1
Flax-spinner	1
Foreign correspondent	1
Forgeman	1
Gardeners	4
Gasfitters	2
Gilder	1
Glass-cutter	1
Goods Collector (Railway)	1
Governesses	7
Grocers and assistants	11
Hatter	1
Hosiers	2
Housekeeper	1
House servant	1
Inland Revenue Officers	3
Iron-founder	1
,, monger	1
,, moulder	1
,, ship-plater	1
,, turners	2
Jewellers	4
Joiners	9
Laboratory assistant	1
Labourers	5
Law stationer	1
Lawyer	1
Linen manufacturers	2
Lithographic artist	1
Machinists	2
Machine joiner	1
Maltster	1
Manufacturers	2
Masons	4
Measurers	3
Mechanics	26
Merchants	2
Millwrights	11
Miners (coal and other)	4
Mining agent	1
Missionary	1
Monitor (paid)	1
Moulder	1
Normal students	4
Oil-cloth maker	1
Operative	1
Optician	1
Organists	2
Overlookers	4
Painters	4
Paper-stainer	1
Pattern-maker	1
Pattern-card maker	1
Pawnbrokers' assistants	2
Picture-frame maker	1
Piecers	8
Piece-lookers	2
Plasterer and builder	1
Plumbers, &c.	2
Police-constable	1
Porters	2
Post-messenger	1
Power-loom overlookers	2
Printers	7
Pupil teachers	53
Railway spring-fitter	1
Roll-turner	1
Roller coverers	2
Saddler	1
Salesmen	3
Schoolmasters	10
,, mistresses	2
Self-actor minder	1
Serjeant R. Engineers	1
Sexton	1
Shawl-cutters	2
,, pattern designers	2
Ship builder	1
,, joiner	1
,, wrights, &c.	24
Shoe-makers	3
Shopmen	4
Silk-sizer	1
,, winders	2
Slider in machine works	1
Smith	1
Soap-manufacturer	1
Spindle-makers	2
Spinners	16
Spinning-master	1
Staff-serjeant (militia)	1
Stationers and assistants	3
Steel-pen tool maker	1
Stock taker	1
Stoker	1
Stone cutters	3
,, masons	3
Store-keepers	2
,, clerk	1
Strickle-maker	1
Striper and grinder	1
Students	2
Superintendant of lunatics	1
Surgeons	2
Surveyors, &c.,	6
Tailors	3
Tarpauling maker	1
Teachers (other than pupil-teachers)	57
Telegraphist	1
Throstle-overlookers	2
Timekeeper	1
Tin-plate workers	4
Tobacco manufacturer	1
Tobacconist	1
Tobacco-pipe maker	1
Tool-maker	1
Tutors	4
Turkey-red dyer	1
Vellum binder	1
Viewers (Tower)	2
Warehousemen and lads	52
Warp-dresser	1
Watchmakers	2
Watchman	1
Weavers	48
,, foremen of	2
Wheelwright	1
Whip-lash maker	1
Whitesmith	1
Wine and spirit merchant	1
Wire-drawer	1
Wood-carver	1
Woollen manufacturer	1
Woolsorters	6
Wright	1
Writer	1
Undetermined, or not given	33

The CHAIRMAN said he thought the Conference would agree that the report just read, as well as the extracts from the remarks of the examiners, gave a satisfactory statement of the progress made, though there was still room for great improvement. They found that there was an increase in the number of candidates, as well as in the number of prizes given, and generally speaking the papers had been worked out better than on previous occasions. One important feature in the report was the appointment of visiting officers, through whom the Society would receive authentic accounts of what was taking place in the several District-Unions, and be informed in what manner the Unions thought the Society could most efficiently aid them in their work. He regretted that he was compelled, by an unavoidable engage-

ment, to leave the chair, and he would request his friend, Sir Thomas Phillips, to preside.

The chair having been taken by Sir Thomas Phillips, discussion was taken on the first subject on the list, viz.:—

"In what manner can the Agents of the District-Unions, who have been appointed Agents to the Society of Arts in their respective localities, best carry out the objects of the Society, and promote the welfare of the Institutions.

Mr. Barnett Blake (Yorkshire Union) said, looking to the experience of past Conferences, he thought it advisable that each subject to come before them should be brought forward in the tangible shape of a resolution, as introductory to the discussion. With regard to visiting agents, they must bear in mind the object was to bring the Institutions in the country into more intimate co-operation with the Society of Arts. Although the Society had exercised a valuable influence in the matters of Arts, Manufactures, and Commerce, still, education was not the least important subject which the Society had taken in hand, for the success of Arts, Manufactures, and Commerce must in a great measure spring from the proper education of the people. On the subject now before them he suggested that the visiting agent should receive authority from the Society to act as its representative in the local Institutions, so that he might represent the Society with some authority on certain occasions—that he should visit all the Institutions in the district, and give information as to the examinations, recommending their adoption in places where they were not yet carried out. In addition to that, the agent should visit all the larger Institutions not in Union, and bring before them the advantages of being so connected with the Society. He had endeavoured to embody these views in a resolution, which was then read.

Mr. Harry Chester said, no one who had had experience of the operations of District Unions of Institutions could doubt that they presented advantages which could not be gained in any other way. The Council of the Society wished to have this subject again discussed to-day, for the sake of ventilating it, and in order that the example set with such good effect in different parts of the kingdom should be followed in other places, and other District Unions formed. It was no part of the view of the Society to *compel* Institutions to form themselves into Unions. It must be left to each district to determine whether it would have a Union, and to every Institution to determine whether, if a Union were formed, it should be connected with it or not. With reference to the visiting officers just appointed by the Council, he was sure no one who had had experience of the working of District Unions could doubt that the visiting officer was the life of the Union. His friend Mr. Baines had often spoken of the advantages of the Yorkshire Union, of which Mr. Barnett Blake was the efficient agent; and Lord Lyttelton, the President of the South Staffordshire Union, had expressed his opinion that the visiting officer, Mr. Jones, was the backbone of that Union. In speaking on behalf of the Metropolitan Association, he (Mr. Chester) could say they would not have made a twentieth part of the progress they had if it had not been for the services of Mr. Sales, their secretary and visiting officer. At the last Conference it was suggested to the Council that there was in the country a want of more close connection between the Society and the local bodies, and a resolution was passed recommending the appointment of agents, whose duty it should be to visit the various Institutions. It was to be clearly understood that the Council did not propose to force this upon any Institution; each must determine whether it wished to receive the visits of the officer or not. Then came the question how the Council could carry out this plan? It was impossible, as stated in the report, for the Society to appoint a *corps* of officers who could undertake to visit the whole of the Institutions. The expense would be enormous, considering the number of Institutions and how they were scattered over the kingdom; but it occurred to the Council that they might avail themselves, in a manner most acceptable to District Unions, of the services of the officers whom they had themselves appointed—each district union determining whether its own visiting officer should receive this appointment from the Society. For the most part he believed the Unions desired that such appointment should be given to their own officers. He had not proposed to pass any resolution on this subject, but it was wished that a discussion should take place upon it in order that the Council might ascertain the views of the Institutions on the matter. He agreed with Mr. Blake with regard to the duties of the visiting officers—but he would go further than that. He thought the officer would not do all that was desired if his services were confined to explanations of the scheme of Examinations, and suggestions that that scheme should be more extensively adopted. When in the year 1851, he first proposed the Union of Institutes with the Society, his first idea was that it should be a means of enabling the Institutions to promote the whole of the objects carried out by the Society of Arts. On this view he conceived the visiting officers might be media of communication between the Council and the local bodies as to most of the operations embraced by the Society. For instance, a short time since they held a Conference on the subject of dwellings for the poor, which he hoped would lead to some practical result, and he conceived the visiting officers might with advantage put before the different Institutions in the country such a subject as that, communicating to them the different publications issued by the Society, and suggesting the ventilation of the same subject in the different Institutions. The result of that would be—they should not only have the opinions of those who met at head-quarters, but the opinions of the whole country. Upon those considerations he should like to enlarge Mr. Blake's resolution.

Mr. Talbot (Messrs. Chance's Library, Birmingham) wished to bring before the Conference a striking fact in connection with this subject. He held in his hand records of last year's certificates, arranged in the order of counties, and he found that those counties which employed an organised agency had obtained the largest number of certificates at the Society's examinations. Thus Staffordshire had obtained one certificate to each 7,000 of the population; in that county there was an organised agency. Yorkshire, which had also an agency, obtained one certificate to 10,000 of population. Middlesex, including London, one to 13,000 of population. And then, going to the bottom of the scale, Warwick, which had no Union or organised agency, had only one certificate to 140,000 of its population. The last mentioned fact went to show the importance of this organising agency which they had been advocating. With reference to the starting of these Unions in new localities, with the view to the employment of an organised agency, it fell to his lot to have something to do with the starting of the South Staffordshire Union, about four years ago. That district was comparatively small in area, and it came to be a mere matter of visiting several localities to discuss the foundation of a Union, which he was happy to say was accomplished with very little trouble, and without much expense. In counties of a more extended area, involving travelling long distances, he believed the object might be accomplished by correspondence.

Dr. Pankhurst (Lancashire and Cheshire Union) expressed his pleasure at the satisfactory character of the report. There were two points of importance in it with reference to the operations of district unions. He could not help thinking that if there was any department of education which was in danger of being neglected it was the elementary portion. There was great temptation to pass that by, and unless an organisation of a specific character was established in the country districts they would not make any solid improvement. The Lancashire and Cheshire Union had used the elementary papers this

year, and it would have been of great value to them if a visiting agent had collected and laid before them the experiences of other districts on this matter. The Union he represented had suggested a modification of the scheme of Examinations, which had not been carried into effect, but he felt persuaded, after some experience in this matter, that a scheme might be constructed which would suit each locality without disturbing that uniform character which such examinations ought to possess. The fact of the same papers being used in the various localities produced a certain amount of uniformity, but it was also important, in estimating the value of the answers, that some uniform scale should be adopted. In the Union he represented he believed they were more exacting than was the case elsewhere. They might appear to stand at some disadvantage in that respect, but it would ultimately turn out to their profit. He would say nothing so imperatively demanded the earnest consideration of those who had to do with district unions as the taking a firm stand in respect to elementary teaching. He believed organizing agents, authorised by the Society, throughout the kingdom, would do incalculable service.

Mr. Edward Baines (Yorkshire Union) said as far as he understood it the definition of the duties of the agents, as conveyed in the resolution just read, was good, and appeared to include the leading points to be attended to by those officers. He thought in addition to this it was very desirable that occasional visits should be paid by some member of the Council itself as the immediate representative of the Society, and he could promise them a very hearty welcome in his own district. He believed that would have considerable influence in the District Unions, far more than that of the local agents. He believed the working of the Local Educational Boards had been exceedingly satisfactory. In Yorkshire they had been the means of greatly stimulating the classes, especially those of the evening schools. Almost all the solid good in these Institutions was done by the regular studies conducted in the evening classes. Lectures and libraries were good things, but were not to be compared in point of solid efficiency with the evening classes, in which systematic instruction was given and regular habits of study were formed. He was glad to see the progress which had been made in the examinations under the West Riding Educational Board. He agreed with Dr. Pankhurst that it was desirable to insist upon the utmost amount of accuracy in the examinations, inasmuch as a loose mode of conducting them must lead to very unsatisfactory results. He took this opportunity of bearing his testimony to the well-working of the system. He hoped they would be able to bring a much larger number of Institutions into District Unions. He considered the superintendence thus exercised was of great value, and he would encourage the Society to go on in this direction, and, if possible, to cover the entire country with effective and valuable organizations of this character.

Mr. Bullock (Crewe Mechanics' Institution) thought district agents might do much good in finding out those localities in which no Local Boards existed, and which were at present wholly ignorant of the educational operations of the Society. The first step was to get a properly qualified person to act as the chairman of a Local Board, and after that was done the constitution of the board was an easy matter. Another way of increasing the scope of the Society's examinations would be by the district agents calling public meetings in the localities of the large employers of labour, and inducing the employers themselves to attach a value to the certificates granted by the Society; for after all they must look to some pecuniary value to the certificates. If they looked through the present list they found that there were few candidates who had obtained more than one or two certificates. What they wanted was to see the number of certificates to one candidate increased; and he suggested whether in the case of three or four certificates being obtained by one pupil the Society could not give such a form of certificate as would be a valuable testimonial for a young man to present to an employer of labour. For instance, if a youth wished to go into a booking office, such a certificate of his competency in book-keeping and arithmetic ought to carry considerable weight with an employer. He thought district agents would be the best means of extending a knowledge of the operations of the Society in every part of the country.

Mr. Chester suggested that Mr. Blake's resolution should stand as follows:—

"To ask the Council to consider the following recommendations:—

"That every district agent should receive from the Society of Arts an authority to act as its representative.

"That he should visit the Institutes in the district in Union with the Society, to give information in respect to the Examinations of the Society, and to recommend their adoption.

"That he should visit all the larger Institutes in the district, and urge on them the importance of being united to the Society for the conduct of the Examinations, and should act generally in furtherance of the objects of the Society.

"That he should report to the Society from time to time as to the condition and operations of the several Institutes in Union.

"That he should attend public meetings of the Institutes, to advocate the Elementary and Advanced Examinations."

Mr. Baines would be sorry if the agent spent his time on objects not strictly in accordance with educational matters.

Mr. Chester remarked that the first thing to be considered was the duty of the district officer to his own district union. He should, however, be sorry that those officers should be precluded from saying anything about the general objects of the Society, because he was aware that they were regarded by most Institutions as coming within their scope.

Mr. Sales (Metropolitan Association) was in favour of the resolution as modified by Mr. Chester. It was already the duty of the district officers to make known the scheme of the Society's examinations, but he thought something beyond that was required. There was a wide field open for making known the operations of the Society bearing on the education of the working classes, and there was, in his opinion, no more important subject to be propagated than the prizes instituted by the Society for Art-Workmanship. He had been engaged in getting up an exhibition in the north of London, on which occasion a body of fifty workmen were brought together, not one of whom was aware that prizes were awarded by the Society for the encouragement of art-workmanship. If the duties of the district officers were to be confined to educational matters, a great part of the work of the Society would be omitted.

The above resolution was then passed.

Upon the next subject in the list, viz.:—

"The Advantages of District Unions; how the Society of Arts may best Promote their Formation, and aid them when Formed?"

Mr. Barnett Blake proposed the following resolution:—

"That in the opinion of this meeting the Society of Arts might promote the formation of District Unions:—

"By circulars detailing the several advantages of local organisation.

"By suggesting rules for the government of Unions.

"By suggestions as to a Central Institute and proposals for a conference of representatives of Institutes within the district.

"By the visit of a representative of the Society of Arts to advocate personally the formation of Unions."

He instanced cases in which the formation of district unions had taken place in various parts of the country through the exertions of a single Institution which had taken the initiative in the matter, and amongst the most successful unions he mentioned those which existed in Devonshire, Somersetshire, Norfolk, and several of the Midland Counties. He bore testimony to the advantage

of united action in giving to the Institutions an importance and a standing which they would not otherwise attain.

Mr. Monk (Faversham Institute) was much pleased with the suggestions contained in the resolution proposed by Mr. Blake. The committee of the Institution he represented had invited the other institutions in Kent to a conference, to be held in July, on the subject of the formation of a Union for that county. Twenty-five Institutions had been written to and seventeen replies had been received up to that time, but out of that number only four were favourable to the formation of a county Union. By the remainder the advantages of such a Union were questioned. He thought the object would be promoted by the publication of a circular by the Society, pointing out the advantages of district Unions.

Mr. Chester said he should support the resolution, and he thought such a circular as had been suggested by the last speaker might be issued, to which might be added a copy of the regulations under which existing Unions were conducted. With reference to the suggestion of his friend Mr. Baines, that occasional visits should be paid by members of the Council to the country Institutions, he had no doubt many of his colleagues would be happy to make those visits as opportunity occurred. With so active and intelligent an officer as Mr. Monk, and under the auspices of an Institution so admirably conducted as was that at Faversham, he had no doubt they should soon see a Union in the county of Kent. When the Union of Institutions with the Society of Arts was first established, it was held by some that Local Unions were unnecessary; but he wished to state that that doctrine had never been held by the Council, but they had always recommended the grouping together of Institutions, after the example of the Yorkshire and other Unions.

Dr. Bond (Hartley Institution, Southampton) had listened with great pleasure to Mr. Blake's proposition, because it helped to remove a difficulty which he had individually felt. He was connected with one of the largest Institutions in the south of England, which, though only of recent existence, had warmly taken up the objects promoted by the Society of Arts, and strongly advocated the plan of bringing the Institutions into more intimate relation with each other by means of district Unions. He must apologise to Mr. Best for trenching in some measure upon that gentleman's own particular ground; but he would pardon the remark that the Southern Counties Union did not so completely cover the ground as it might do. He (Dr. Bond) felt that it was difficult for any Institution to take the initiative in establishing such a Union, and if this could be done by the Society it would give a definite authority to any appeal that might be made.

Hon. and Rev. S. Best (Southern Counties Society) felt himself placed in rather an invidious position by the remarks of Dr. Bond. He had felt for a long time the exceeding difficulty of uniting the adult education in schools with the classes of an Institution. The Southern Counties Adult Education Society, which he represented, dealt very largely with night schools in villages, and there had been the greatest difficulty in getting the Institutions in the towns to co-operate with them. Dr. Bond would bear him out that they had not received any strong encouragement from Southampton; and within the last three years, when there were some pupils who wished to go up for the Society's final examination, he was obliged to go to Southampton with a view to constitute a Local Board for a town which was the metropolis of the South of England. He felt there was a difficulty in dealing with the adult education in connection with the country Institutions which did not occur in such Unions as Yorkshire and South Staffordshire; but in Dorsetshire, Hants, and Wilts, if they sent a person to visit those, he was afraid it would require more funds than they could command. He should be delighted to co-operate with Dr. Bond, but after ten years' experience in the management of an Adult Education Society he had felt the difficulty of getting the Institutions in towns to combine with those kindred societies in the villages.

Mr. Chester wished to be understood that in supporting the resolution he did not imply that the Council would adopt the precise model of any existing Union with a view to recommend it for exclusive adoption throughout the country generally. In such a town as Southampton, in particular, a vigorous effort might be made in this direction, and with the co-operation of such gentlemen as the representative of the Hartley Institution the best results might be anticipated.

Mr. W. Mogg (Devonport Mechanics' Institute) expressed his anxious desire to see Unions carried out in his district, embracing the counties of Cornwall, Devon, and Somerset, but, as in the case of Southampton, no Institution appeared willing to take the initiative. If the Society could send down an agent to talk the matter over, they would very soon constitute a Union in those counties; but they wanted assistance in the matter.

The Chairman remarked that, however fairly these Unions might be started, they could only exist and thrive by local effort. The Society might aid in originating them, but that would be of little value unless there was sufficient vitality in the district to keep them going after they were established. He then put the resolution, which was unanimously adopted.

The Chairman having introduced the next subject, viz.:—

"The best Means of Developing the Social Character of the Institutions,"

Mr. Chester suggested that the discussion should embrace the fifth subject on the list, viz.,—

"What is the Influence of the Working Men's Clubs, formed in various Localities, on the Educational Character of the Institutions in those Localities?"

which he said he had placed on the paper with reference to the question which was now assuming so much importance—viz., the Working Men's Clubs.

Mr. Jones said he had suggested the first of the above subjects, because in South Staffordshire some difficulty had been experienced in developing the social element in connection with the Institutions. They had entered freely into the movement for promoting the social character of the Institutions, and had taken what steps they could in the formation of clubs, and, in some instances, those clubs were established in places where Mechanics' Institutes were already in existence. The work of both bodies went on, but in the Examinations this year it became apparent that some influence had been at work which considerably modified the results as compared with former years. On inquiry into the cause he found that in Wednesbury, where a Working Men's Club had been formed, whereas for the two last years they had successful classes of an elementary as well as of a more advanced character, from which there were numerous candidates for the examinations, in the present year the remarkable fact presented itself that they had not a single candidate from that town. In the meantime the Working Men's Club had gone on flourishing, and had done very good work. Inquiry was made in other quarters, and it was found that the instance he had referred to was not a solitary one, but at West Bromwich, where they had formerly a good many candidates, this year there were no candidates for the elementary examinations, and only two old candidates for the final examinations. There was a most successful Working Men's Club in that town. With respect to evening classes it was found that where a club was established between two or more night schools, the immediate effect of the club was to draw away the young men from the night schools, but that arose in a great measure from allowing youths to enter the clubs. He was desirous to have the

experience of representatives from other parts of the country in this matter. He brought this subject before the late Conference on Working Men's Clubs, and it was there thought that the results he had mentioned were exceptional, but he should like to hear whether any similar cases had occurred elsewhere, as it would be of assistance in developing any plans for the future in connection with promoting the social character of the Institutions. If the results he had referred to were general, they must be very cautious in introducing the social element, and he hoped to hear that the cases he had mentioned were exceptional.

Rev. RICHARD WHITTINGTON (City of London Working Men's College) said, although the remarks they had just heard applied more particularly to country Institutions, he felt it was a subject of great importance how far these clubs were likely to affect Institutions generally in their educational character. He confessed the statement of Mr. Jones surprised him, as he had looked upon these clubs as auxiliaries rather than as antagonistic to the Institutions. He would ask Mr. Jones if he could state the extent to which working men were members both of the Institutions and of the clubs.

Mr. JONES believed that many who were members of Institutions had left them to join the clubs.

Mr. WHITTINGTON added that in the college over which he presided they made it a prominent point to endeavour to engraft as much as possible the social upon the educational system for the young men upon the model of the clubs, and he had not found that the classes suffered thereby. He thought they might promote the social element in other ways than upon the system of clubs. It had been the general feeling for many years that this element had not been sufficiently cultivated in these Institutions. Various kinds of games were introduced in the City of London College, and if they had the room and sufficient funds it would be made more of the character of a club than it was at present.

Mr. BARNETT BLAKE would have great pleasure in proposing a resolution pointing out the manner in which the social character of the Institutions might be advanced. He believed the more they promoted that character, within reasonable limits, the more attractive they would make the Institutions to those for whom they were chiefly designed; and, notwithstanding what had been stated by Mr. Jones, as to the effects of the clubs, they must look at the question in another point of view. In the majority of the Institutions in town and country, the young men going there in the evening must submit to the silent system enjoined in the reading-room, and if a question was asked it was regarded as an interruption. What they wanted was a room in which conversation would be allowed—their object was to establish a counter attraction to the public-house. A working man, after the business of the day was over, wanted a place in which to spend an hour or two in social intercourse with his fellows, with a good fire and a good light. The introduction of such friendly games as might be approved of, would be an attraction to join the Institution, and by that means they came to be made acquainted with the fact that in another part of the same building they might enjoy the advantages of instruction if they chose to avail themselves of it. Mr. Blake, having further argued in favour of extending the social character of Institutions, read a resolution embodying his views.

Mr. CHESTER entirely concurred in the views expressed by Mr. Whittington and Mr. Blake, although he did not fully subscribe to all the points in the resolution just proposed. In placing the subject on the list, the object was to ascertain the views of the Conference on the question, as well as to receive suggestions as to the direction in which the object could be best promoted. For many years past he had desired to see a more club-like and social character imparted to the Institutions, and he thought where the effects stated by Mr. Jones were produced there was something ill-conceived or ill-advised in the constitution of the clubs referred to. He could not but think, if they gave a social character to the Institutions, they would attract the young men of the locality, and put them in a position to educate themselves. They were all aware that a vigorous movement had been set on foot for the establishment of Working Men's Clubs, and although he desired to see the means of recreation for the working classes extended, he had some doubts as to the beneficial tendency of the movement to which he had alluded, because it was setting up clubs apart from the Institutions, which ought to have their first consideration. He thought it would be rarely the case that the means of supporting two separate Institutions in a small town could be found. The clubs would be calculated to injure the Institutions, and *vice versâ*. In London, of course, there was room enough for all, but in the country it was different, and it was not to be expected that the working classes could derive those educational advantages at the club which they obtained at the Institutions. He did not object to the spirit of Mr. Blake's resolution, but when so many things were specified there were others which might be included; and athletic sports in the summer time ought to be encouraged as much as possible.

Mr. SALES thought the resolution was rather behind the day, as far as many Institutions in London were concerned. There were a great number of Working Men's Clubs in London, and though he could not bear the same testimony that Mr. Jones had as to the prejudicial effects they had had upon the Examinations, yet he believed there was great unwillingness on the part of the majority of those clubs to introduce the educational element. In the case of many of the clubs they had degenerated from the principles on which they were first established, and were now little better than "free-and-easys." In the Paddington Institution sports and music had been introduced with the best results, and a place was provided for refreshments. The Metropolitan Association had organised an excursion to the Crystal Palace on the 27th inst., on which occasion a very large gathering of the members of different Institutions would take place.

Dr. PANKHURST, in moving the following amendment:—

"That every encouragement be afforded to the development of the social characteristics and agencies of the Institutions, by facilitating the formation of Working Men's Clubs and other similar organisations,"

stated that he was very glad that the subject—a very important one—had been submitted for discussion. The managers and friends of Mechanics' Institutions were sometimes in the habit of using the language of apology and apprehension in regard to the movement. The question of the "social element" in general, and in particular as manifested in the form of Working Men's Clubs, had often been acknowledged, because it was impossible to ignore it—because it made itself felt as a sort of irrepressible force. It was well that they should face the question, and come to a deliberate conclusion. He thought that Working Men's Clubs and other similar organisations ought to be gladly accepted, and drawn into the service of education. In point of fact, the new movement was not only not hostile, but was a part, and indeed a very important and essential part, of education. We ought to expect that education should refine the taste, soften the manners, and give simplicity and harmony to the life. The formation of such Institutions as those just referred to would give room and opportunity for these influences to manifest themselves. Many who could not be got now to submit themselves to systematic culture by any invitation to classes or lectures, might be insensibly led on to such a course by seeing how education tended to make men become, by a sort of quiet necessity, well-mannered and refined. It must be distinctly remembered that the tendency towards Working Men's Clubs was not now being created; it existed already, and the real point was, how that element was to be most wisely dealt with by the friends of Mechanics' Institutions. Whether they wished it or not, working men would have their clubs. If the present opportunity of drawing them into close alliance with Mechanics'

Institutions were lost, it might never occur again. Let them heartily and readily recognise them, and establish an intimate association between the two. It was also possible to approve the movement on another ground—it was an effort to bring under cultivation a neglected field of education. The case cited by a preceding speaker as to the prejudicial influence of a Working Men's Club, admitted of two observations—one being that the Club in question was not in connection with any Institution, and the other being that a power that had been neglected when at first it came into exercise, was liable for a time to pass into undue activity. Education was distributed into two great divisions, teaching and training; now the present movement was really an educational one, considered as a part of training. It helped to elevate the taste, to form simplicity of character, and to produce more refined habits of enjoyment. We had never sufficiently recognised the importance of the element of pleasure and the love of the beautiful, as a constituent of education and of all right living. The moral and spiritual uses of pleasure had never been adequately admitted. Wisely used it relaxed the mind, refreshed the body, and opened the heart. Let every effort be made to provide the labouring community with more abundant and varied sources of pleasure and recreation. Indeed, when the working classes were found more capable of finding real gratification in more simple pleasures, in more refined and purer forms of enjoyment, then their lot, considering the other influences so powerfully working in their favour, would unite more independence, ease, and freedom, than could perhaps be found in any other condition in society. On those grounds he earnestly pressed the Conference to give at once an earnest and warm welcome to the Working Men's Club movement, and other similar manifestations of the social element. These things represented great and growing powers in the social system, which, if wisely directed, would prove most influential ministers of the great cause of education, but which, if coldly and jealously regarded, might be turned into its most vigorous and persistent enemies.

The Chairman (Sir Thomas Phillips) having read the amendment submitted by Dr. Pankhurst, said the objection he felt to it was this: it did not distinguish between Working Men's Clubs occupying a position which might become antagonistic to the Institutions and the promotion of the social element *in* Institutions. He could readily conceive the state of things mentioned by Mr. Jones, that if they had two Institutions in many ordinary-sized towns they would have what the people would be disposed to regard us rival establishments—probably as antagonistic; not necessarily so in fact, but they would be so regarded. He felt, with the gentleman who had last spoken, that the social element might be largely and safely developed. The question was as to the mode in which they were to regard it. He saw no reason why the manners, the sympathies, and the feelings of an educated class might not be communicated in an Institution as well as in a club. Therefore he did not feel that the argument tended to show that they ought to have a separate organisation. Mr. Blake's proposition was that the Institution should encourage the social element, and he thought that might be effected by means of one organisation. He believed in many places it would be found inconvenient, and even injurious, to attempt a second organisation for the purpose. The difficulty was, as Mr. Chester had said, in many towns to form even a single organisation; and if they were to have but one, having regard to the education of the young men of this land—and he held physical training and formation of character to be a part of the teaching of the Institutions—he would subordinate the Club to the Institution. Therefore he would ask Mr. Blake to allow "athletic games" to be added to his resolution, which would then stand as follows:—

"That the social character of Institutes may be materially promoted by the addition of a room for conversation, indoor games (such as chess), and greater freedom than is ordinarily allowed in a reading-room, by encouraging athletic games, and by occasional excursions for recreation, and social gatherings for conversation, short readings, music, microscopic and photographic exhibitions, and similar entertainments, on which occasions suitable refreshments might be provided."

Mr. E. Baines said this was a subject of extreme difficulty and great importance. The present tendency was much in favour of Working Men's Clubs. It was so certainly in London, and he believed it to be very much the case in Yorkshire, as shown at the Sheffield meeting of the Yorkshire Union. He admitted the desirableness of encouraging the social element, and he agreed with Mr. Blake and Mr. Chester in the recommendations they had given as to the kind of amusement which they might supply to and properly connect with the Mechanics' Institutions, but what he was afraid of was a class of Institutions rising up separate from educational agencies, and rivals to them, which were calculated to engender too great a love for pleasure. Self-denial and self-control were the great habits they had to promote by education. The educational element in Institutions should be preserved, and not prejudiced by conflict with anything more inviting and attractive. They should cultivate classes, lectures, and libraries, and endeavour to make them as attractive as possible. He did not see how this resolution could appropriately come before this meeting. It was quite proper to consider what they could do to add to the social element; but how they could recommend the formation of other Institutions of a separate nature he did not understand, and that he thought was a fatal objection to the amendment proposed. He believed in-door and out-door amusements and games, including athletic sports, were desirable, but if these were to be encouraged to the exclusion of the higher phases of education he could not approve of them. His only fear was that the too extensive introduction of this element would operate unfavourably to the educational element, which they were so desirous to promote. Therefore, he must express his dissent from the amendment proposed by the representative of the Lancashire and Cheshire Union, but he was prepared to support the original resolution as amended by Sir Thomas Phillips.

Mr. Bullock concurred in the observations just made. If they introduced too much of the social, the educational element was likely to suffer, and if they went to those places where the recreative element was in the ascendant they found that very few certificates of the Society were obtained. At Crewe a gymnasium had been established, and it was so attractive that the committee found it necessary to prohibit visits to it on class evenings. It would not do to "sugar" education so much as some people appeared to think should be done; but the members of the Institutions must be taught to value education for its own sake.

Mr. Stephens (Westminster Working Men's Club) stated that in that Club the educational element was not lost sight of. The lowest age at which members were admitted was 18. In the winter months the average attendance was about 130 on each evening, and out of that number between 30 and 40 young men attended classes three times a week, and the result had been that many youths who could scarcely read and write when they joined the club could now do both very creditably. He believed the social element of the club had been the means of introducing these young men to the advantages of self improvement in the elementary branches of education, and from the club-room they were led to the class-room. He thought working men's clubs, to be successful and lasting, must include the educational element. As regarded Mechanics' Institutions great caution must be exercised in introducing the social element into them. The class of men who attended these Institutions had a greater desire for education than those who joined the Working Men's Clubs.

Rev. R. Whittington hoped to hear the results of the working of those clubs in other parts of the kingdom. He

thought they ought not to be too hasty to form an opinion unfavourable to the clubs, from the single instance they heard as to their effects upon the institutions in our locality.

Mr. SALES said he had visited one of those clubs in his own neighbourhood, and, judging from that, he confessed he had no desire to witness their extension. On Saturday nights there were singing and recitations of the "free-and-easy" character, and he considered in that instance at least the club had degenerated from the principles on which he understood these clubs had first started.

Mr. NOLDWRITT (Walworth Literary Institution) stated that in several parts of London, what were called co-operative clubs had been formed at public-houses and beer shops, in which it was announced that an extra supply of newspapers and periodicals was provided, and solicitations were made for books. It was, however, to be feared that those co-operative clubs principally served to contribute to the private interests of the persons at whose houses they were held.

Mr. C. J. WOMERSLEY (Hastings Institution) expressed his satisfaction that in the course of this discussion the primary objects of the Institutions were not wholly lost sight of, because, judging from the amendment now before them, it seemed almost to ignore those objects. Of this he was quite satisfied, if they did not intend it, the effect of the introduction of the new element of amusement had been that in many parts of the country this took the place of the more solid objects which were contemplated by the promoters of Mechanics' Institutions as a means of increasing the popular education of the country. The proposition to provide a separate establishment for recreative purposes in connection with them could obviously only be entertained by the larger and richer Institutions. There were excellent Institutions in St. Leonards and Hastings, and it happened that in each of those towns a Working Men's Club had been instituted, and in both cases the operation of those clubs had been antagonistic to the Institutions, and he was not sure they would not eventually undermine the powerful influences of those Institutions for good. He did not say that they could hope to prevent those who regarded amusement as the chief good from seeking it where it was to be found, but it was a question with him whether that object should be promoted by this meeting to the extent that had been proposed, and every step they took in this direction ought to be extremely guarded.

Mr. CHESTER would be sorry that Working Men's Clubs should come under a general condemnation from the alleged deficiencies of some of those Institutions. In the case of the Duck-lane Club it was evident, from what had been stated, that first principles had been adhered to and that good educational results had attended the formation of that Club, whilst the recreative department was of an unexceptionable character. The objection he felt to Mr. Blake's resolution was in the principle it enunciated, that the social element could only be introduced into the Institutions by providing separate accommodation for that purpose. He (Mr. Chester) should prefer a more general resolution, affirming the desirability of making some provision for the social wants of members of the Institutes—for their innocent amusement and refreshment after the hours of labour, and providing for physical training, which ought to be a part of education. Whilst he believed a resolution to that effect would be unanimously approved by the meeting, it would avoid expressing any censure upon the Clubs generally.

Dr. PANKHURST said he proposed to complete his amendment by adding "in connection therewith" after the word "facilitating." It had been said that these clubs were a new affair, and yet they seemed to be strong enough to shake the foundations of Institutions which had existed for a long period. Was not that a reason why they should endeavour to bring them into harmony with the Institutions before they completed their counteracting effects? for whether they used the term "Working Men's Clubs" or "Mechanics' Institutions," the spirit of the thing was substantially the same. They were not creating a new power, but they had to deal with an accomplished fact, therefore the question to be determined was, Would they endeavour to bring the principles of the clubs more into harmony with those of the Institutions, or would they allow the clubs to exist as antagonistic to the Institutions?

Mr. THOMAS WINKWORTH (who had taken the chair on Sir Thomas Phillips being compelled to leave) said, if it was competent for him to do so he would second the amendment of Dr. Pankhurst with great pleasure, because he fully sympathised with all that gentleman had stated. It was not in the power of this meeting to ignore the fact that the social element was largely gaining ground amongst the working classes; and if what had been said was correct—and he could personally endorse a great deal of it himself—it would be better for them to endeavour to bring that principle as much as possible into harmony with the spirit of the Institutions than allow it to remain in antagonism to them.

Mr. HELLER (Clapham Local Board) thought the case was sufficiently met by the terms of the original resolution, to which he said he should give his support, and he advised the withdrawal of the amendment.

The CHAIRMAN then put the question, when the amendment was negatived by a large majority, and the resolution of Mr. Blake was adopted.

Mr. CHESTER suggested that as the time of the meeting was so far advanced, those subjects on which he apprehended there could be no difference of opinion should be affirmed by the Conference without discussion, and that they should proceed to those matters on which the Council desired to have an expression of opinion. On the subject of the desirability of promoting popular readings in the Institutions, he believed they would all be agreed. The following, viz.:—

"THE BEST MEANS OF PROVIDING FOR THE EDUCATION OF WOMEN AND GIRLS AFTER THEY LEFT THE DAY SCHOOLS,"

Was a very important one; and with regard to No. 7, which referred to the desirability of adding needlework to the Programme of the Society's Examinations, it would be desirable that the opinion of the Conference should be given as to the probability of a sufficient number of candidates coming forward under that head to justify its addition to the Programme. A strong feeling had been expressed in some quarters in favour of adding Italian to the list of Examinations, and the Polytechnic Institution had offered to give a prize in that subject. The only objection to it was that some persons thought it would be carrying the Examinations above the class for whom they were intended; but, on the other hand, the development of trade and intercourse with Italy created a demand for clerks and others who understood that language.

Mr. BLAKE proposed the following resolution:—

"That as needlework is an indispensable part of the Elementary Examinations for Female Candidates, it might with advantage be added to the list of subjects for the Final Examination, regard being had to quality of work and time occupied in the performance."

Mr. CHESTER seconded the resolution, and asked whether it was desired to add Italian?

Mr. REYNOLDS (City of London College) believed that in the increasing demand for the Italian language in this country, there would be a great many candidates in that subject. Had that been included in the list this year, there were several pupils of the college who would have come up for examination.

Mr. JONES stated that Italian classes had been commenced in his locality, and he was favourable to its being added to the list.

In reply to an inquiry from the Rev. R. WHITTINGTON,

Mr. CHESTER thought there would be no difficulty with regard to the examinations in needlework. The elementary examinations would be conducted as usual by the

district unions, and competent examiners would decide upon the merits of the higher branches of the art. On all accounts needlework must be regarded as a most important and essential branch of female education, which it was to be feared was at present too much overlooked.

After a conversation, in which Mr. Bullock, Mr. Jones, and Mr. Sales supported the proposition,

Mr. Talbot proposed, as an amendment, that it was not expedient to add "needlework" to the present list.

On the question being put the amendment was negatived.

On the next subject, viz.,—

"How can Physical Education be promoted by the Institutions, by the District Unions, and by the Society of Arts?"

Mr. Barnett Blake proposed the following resolution:—

"That classes for the practice of cricket and other athletic games should be formed, and emulation be excited by friendly contests with other Institutes, for which District Unions might be the means of communication and arrangement; that, where Institutes are not too distant, ground might be rented for mutual occupation, and that the Society of Arts or District Unions might give annual prizes for success in competition."

Mr. Blake added that with regard to country Institutions, the physical training of the population was a most important branch of education, and it was his desire to see our national athletic sports largely engaged in. He suggested that a challenge-cup should be instituted for contest between different counties in the game of cricket.

Mr. Sales had great pleasure in seconding the resolution.

Mr. Womersley thought it was not worth while to discuss this question.

Rev. R. Whittington was of opinion that physical education was a most important point to be considered, inasmuch as mental education could not go on without the accompaniment of physical training. It was found as a rule, that those who excelled most in the classes were those who were the most proficient in the cricket field. He should like a gymnasium attached to every Institution, and he believed it would be the means of promoting the other branches of education.

Mr. Chester agreed with the last speaker. A friend from Bury, in Lancashire, had informed him that the Institution with which he was connected, had received an accession of forty members through having a gymnasium, and he considered it to be a decided success in all respects.

The resolution was adopted.

The next subject introduced was:—

"The Advantages of Youths' Institutes, *i.e.*, separate Institutes, or separate Departments of Institutes for Youths."

Mr. Chester said he hoped to receive some information from the Rev. Mr. White, in whom he recognised the founder of Youths' Institutes.

Rev. Henry White was very anxious to see Youths' Institutes multiplied as supplementary to the education of the national schools. It was a subject of regret with clergymen and schoolmasters, that the education which a boy obtained at the National Schools dropped through between the interval of leaving school and joining a Mechanics' Institute. The object was very simple, viz., to give a little more life and finish to the old country night schools. It was a theory that a night school did not usually last more than two years. The first Youths' Institute was formed by himself, at Dover, the success of which had not been very large at present, although it had tended in some measure to supply a great want. In some instances they had begun too expensively and on too large a scale, and in others they rather overdid the amusements to the neglect of the education, but under a judicious administration the old night school might be converted into an efficient Youths' Institute, with a discreet admixture of education and amusement. The Institution at Bayswater was the most successful of the kind, and he believed the only fault was it was rather too expensive; and if these Institutions were to be multiplied, due regard must be paid to economy in their establishment. He thought they might in many instances be grafted on the old national school, otherwise they could only be formed in places where they would command a large amount of public support.

Mr. Blake remarked that this subject must be considered solely as one of locality. In large towns and cities like Liverpool and Manchester, Youths' Institutes might succeed and do a great deal of good, but they would not be applicable to the majority of small towns throughout the kingdom. He believed the want in this respect might be supplied by making the Youths' Institutes a branch of the existing Institutions. It was necessary to draw a line as to the age at which youths should be admitted members of the Mechanics' Institutes. In Sheffield the boys left school at twelve or thirteen years of age, and that period up to eighteen was the most dangerous one, and when a proper check upon the habits of life was most required; character, whether for good or evil, was then formed. He had endeavoured to form a plan in his own district for making separate branches of the Institutions, in which the youths would receive education after the hours of labour; in fact, making the night school a branch of the Institution. He begged to propose the following resolution on the subject:—

"That, as much of the success of an Institute depends upon the number of members, it is not desirable to form separate Institutes for youths, but that existing Institutes might make the instruction of classes for persons—say, under sixteen years of age—a separate department, with a rate of subscription entitling the members to class instruction and the use of the library."

Mr. Womersley seconded the resolution, on the ground of the non-desirability of needlessly multiplying organisations of this kind. In his own Institution they admitted members at fourteen years of age, but they were not allowed to take part in the management till they reached the age of eighteen. In the meantime they had the full advantages of the library, lectures, and the educational classes.

Rev. H. White moved, as an amendment, "That the formation of Youths' Institutes was desirable in places where there was a sufficient number of boys to support a separate Institution." With regard to the suggestion that they should be formed within the range and under the same roof as the existing Institutions, he did not think this would succeed. In the three principal instances with which he was acquainted such an attempt had signally failed. There was nothing in common between the two sets of people. The boys were regarded as an annoyance by the older members, and these in their turn were a restraint upon the younger. Inasmuch as these Institutes were only an extension of the old night-schools, which were to be found in every town and village, they could not be regarded as multiplying organisations.

Mr. Sales seconded the amendment, having personally witnessed the good effects of these Institutes. The subject ought to be more fully considered by the Conference before they passed a resolution discouraging Youths' Institutes. He approved of their being grafted upon the night schools in such localities as were unable to carry them out on a larger scale, as he felt the great want of the present day was to make education more attractive.

Mr. Chester agreed with the last speaker that a hasty conclusion ought not to be come to on a subject of so much importance, and he suggested that it should be reserved for future consideration. He agreed that it was not desirable to multiply organisations, and that in sparse populations the operations of the Institutions ought to be as much consolidated as possible; but in London and

large towns capable of supporting them he was in favour of the establishment of Youths' Institutes.

Mr. Hartley mentioned that a Youths' Institute, of a private character, with which he was associated, had worked extremely well; the members of which consisted of youths who had left the industrial schools, and who, after the occupation of the day, assembled in good numbers at the Institute in the evening. If the subject were postponed he had no doubt on a future occasion he should be able to lay before the meeting some facts of interest in connection with these Institutes. The great object was, after putting the youths in the way of getting their own livelihood by industrial pursuits, to attract them from the streets after the hours of labour, and to save them from becoming inmates either of the workhouse or the prison.

Mr. Craig (Glasgow Institution) said the Institution he represented had established separate Institutes for the youth of both sexes with great success. He was not prepared with any details on the present occasion, but he had no doubt he could furnish some valuable information if this subject were postponed till the next Conference.

Mr. Monk considered it desirable to have separate Youths' Institutes in such towns as were able to support them in a proper manner. In the Faversham Institution there were 300 members under 18 years of age, and certain amusements were provided for them, which were extended as opportunity occurred, and he had never heard complaints of their behaviour in the lecture-hall, the reading-room, or the classes. They were admitted at the age of 12, and at the age of 14 they were allowed to attend the reading-room, upon the recommendation of two or three members of the committee, if their conduct in the meantime had been such as to warrant it.

The resolution and amendment were then withdrawn.

The chair was then taken by Mr. Harry Chester, who introduced the next subject, viz.:—

"How far can the District Unions, Local Boards, and Institutions assist in giving publicity to the Competition for the Prizes for Art-Workmanship, and in Encouraging those likely to be Competitors?"

Upon this subject he suggested that the papers issued by the Society could be sent to the districts, and if they saw fit they could circulate them in the several localities.

On the next subject, viz.:—

"Would it be desirable to allow a certain limited Share in the Government of Institutions to such of the Members as may have obtained Certificates at the Examinations?"

The Chairman said the question raised by this proposition was whether in the governing body of the Institution certain places should be reserved for those who had obtained the certificates of the Society; and upon that question he would invite the remarks of his friend Mr. Whittington, who had had some practical experience in the working of it.

Rev. R. Whittington said, having been connected with evening classes in London during the last ten years, he had witnessed with great satisfaction the enlistment into the governing body of Institutions of those young men who had done public honour to those classes. In the City of London College, representative members possessing the Society's certificate, formed the chief portion of the management of the affairs of the college, and several of them were members of the council. His own experience of the working of the system was, that it largely increased the interest which was felt in the proper management of the college, and there was considerable competition for the distinction of being elected a member of the council. In the same college they had established associateships, and those who had obtained three or four certificates of the Society could claim to be admitted as associates, which conferred the privilege of attending the courses of instruction at the college at half-fees. The committees, by whom the details of the management of the college were arranged, were composed for the most part of certificated pupils, and the intimate acquaintance with the minutiæ of the affairs acquired from their long connection with it, proved to be of the utmost service. The college numbered on an average 800 members. He believed the system he had adverted to might be extended to Institutions generally with the best results.

No resolution having been proposed on the above subject,

The Chairman introduced the last subject on the list, viz.:—

"If the Society of Arts were to Publish a Calendar, with the names of all Candidates who have obtained Certificates from 1856 to 1864, at a price to be named, would there be any considerable Number of Copies Subscribed for?"

He said the Council had been informed that such a calendar was not wished for, and therefore they did not propose to do anything further in the matter. One Institution in Glasgow had forwarded a suggestion that the value of the certificates would be increased if the persons obtaining them were permitted to use some initials after their names. He was afraid that was a question which it was not competent for this Conference to entertain without receiving the authority of the Crown, which was the source of all honour, and if they attempted to use the initials without the authority of the Crown they would only incur ridicule. It had however occurred to him, that a young man who had gained a certain number of first-class certificates should be presented with a medal, and he might be designated a student medallist.

The Chairman having inquired whether any other member of the Conference had any other subject to introduce,

Mr. Beale (Banbury Mechanics' Institution) said it was the wish of those whom he represented to know whether it would be competent for pupil teachers to compete for prizes on subjects not included in the programme of the Educational Department of the Privy Council. He thought this would be of great service to that class of teachers.

The Chairman replied that it was decidedly the opinion of the Council that it was not expedient to admit pupil teachers to the competition for the prizes of the Society. Pupil teachers already received greater encouragement than other members of the same class, and it was felt that if they were admitted to this competition it would discourage those who had fewer advantages of instruction. It was often remarked that the good designed for the lower classes alone, frequently passed over their heads to a higher class. This was happily not the case under the present system of the Society's Examinations, for he might state that the gainer of the Prince Consort's Prize this year, though an assistant to a surveyor, was the son of a shoemaker, and rose strictly from the working class. He thought if they admitted pupil-teachers to the competition for prizes, it would strengthen the argument to which he had alluded, and do more harm, as regarded the working classes at large, than it would do good in the case of the pupil-teachers themselves.

The subject then dropped.

Mr. Jones mentioned that notice had been given by the Dudley Institution, requesting the consideration of the Conference on the subject of the registration and taxation of Institute buildings. Mr. Stokes, who represented the Institution from whom the notice had emanated, was unable to attend, and he begged to suggest that it should be postponed till the next Conference.

The Chairman, on the part of the Council, could give the Dudley Institution very little encouragement on the subject of exemption of these buildings from taxation. Public feeling was more than ever against exemptions of any kind, and he did not hesitate to avow that that was his individual feeling, and he protested against the whole system of exemptions.

Mr. Jones said it was in contemplation by the Worcestershire and South Staffordshire Unions to memorialise the Council on the subject.

The Chairman added that any memorial which might be forwarded would receive the best consideration of the Council.

The Secretary requested the opinion of the meeting as to the desirability of publishing a new edition of the List of Lecturers, when a feeling was generally expressed that there was comparatively so little demand for lectures, and the lecturers themselves were now in such direct communication with the Institutions, that such a list was no longer needed.

On the motion of Mr. Reynolds a vote of thanks was passed to those members of the Council who had kindly presided over the Conference, and the proceedings terminated.

Proceedings of Institutions.

Carlisle Mechanics' Institute.—The report presented March 31st, 1864, congratulates the members upon the steadily increasing importance of the Institute. In all respects its position and prospects are satisfactory. The number of its members has sensibly increased; the reading-room is well attended; the library most extensively used, no less than 9,186 volumes having been taken out by the members during the past year; classes have been formed, and some of the members have undergone examination. The committee cannot doubt that the possession of a certificate, obtained under such circumstances, will be an excellent letter of introduction to places of confidence and trust. The lecture hall has been extensively patronised during the past year, and a considerable sum has been realised to the Institution thereby. Important additions have been made to the library, which at present consists of nearly 5,000 volumes, and there are few works of a standard character which are not to be found upon its shelves. A new catalogue is being compiled. There are night classes in full operation, the subjects being drawing, Latin and French, and mathematics, the advantages arising from which are open to the families of subscribers, although not full members of the Institute.

Hertford Literary and Scientific Institution.—The thirty third annual report states that, although it cannot present any feature of novelty to the notice of the members, and although the balance in the hands of the treasurer is small, the affairs of the Society remain in a satisfactory condition. The sum of £49 11s. 4d. is deposited in the savings bank, of which £44 11s. 4d. is for repairs, and £5 for philosophical instruments and diagrams. The conversazioni are continuing for the eighth season with undiminished attraction and with much gratification to the members, as evidenced by the large attendances. Papers of merit, upon subjects of a scientific, historical, biographical, and literary character, have been read and discussed from time to time at these meetings; and the committee feel much pleasure in recording the fact that upwards of forty such papers have been prepared and delivered by gentlemen connected with the Institution, who have thereby rendered valuable assistance to the committee, and ensured the success of these social gatherings. A photographic album, to contain the portraits of all the members, is in course of formation. The treasurer's account shows that the receipts have been £178 18s., and that there is a balance of £4 4s. 1½d. in favour of the Institution.

Marske Literary Institute.—The *soirée* and annual meeting were held on the 23rd May; the Rev. E. A. Lane, the president, took the chair. In his opening address, he rejoiced that the night schools were attended so well, and the readings which had been given for the amusement and instruction of the people. He impressed upon them that the primary object of their night-schools was not for children. They were intended for those who had not opportunity in the day of imbibing knowledge; they were intended for those who, after night comes, though tired, could devote a short time to mental improvement. The Secretary, Mr. Elstob, read the report, of which the following is an abstract:—The total income derived by the Institute was £48 13s. 6½d.; donations paid to the Institute during the year—from the Earl of Zetland, £5; Prince of Wales's marriage, balance left at rejoicing, £12 10s.; from building committee, 12s. 4½d.; towards the building, £2 19s. 6d., making the total sum, when adding the balance of £5 8s. 7d. from the previous year, to be £74 4s. 0½d. The expenditure amounted to £75 16s. 10d. This sum includes several small accounts, amounting to £21 6s. 8d., due on account of the building, making the expenditure to have exceeded the income 12s. 10d. for the past year. The number of volumes in the library at the present time is 514. Various presents of books have been made to the Institute. During the winter there have been three lectures, given gratuitously. There have also been night classes formed during the winter; the number of members who entered for instruction at the commencement of the season was 40; but the committee regret that several of them did not continue to attend, and the Institute has fallen short of last year very much, having had only four candidates entered for examination at the West Riding Elementary Examinations, two of whom have been successful in obtaining certificates. The funds of the Institute were satisfactory, and the receipts nothing short of any previous year. The number of members was 120.

GOLD MINING IN VICTORIA.

By Mr. Philip A. Eagle.

[*Continued from page* 500.]

Chap. IV.

Quartz Mining Adventures—Poverty Reef, Tarnagulla—Prince of Wales's Claim—Mr. Thomas King's Claim—Columbian Reef, Inglewood—Acadian, Inkerman—Quotations of Yields.

The amount of capital at present involved in quartz mining enterprise in Victoria, has been estimated at a million and a half, the value of the machinery in operation being placed in round numbers at one million sterling. A considerable amount of both labour and capital have necessarily been expended on properties which have not yielded any remunerative results. During the joint stock mania, a few years back, when some remarkable successes gave a strong impetus to mining speculation, a large number of reefing ventures were attractively put forward, of the individual merits of which, it is perhaps not too much to say, that the projectors at the time were but little better informed than the public.

Mismanagement and administrative expenses soon wrought a considerable change in the prospects of the shareholders, and after a totally inadequate trial of the mines, a large proportion of the schemes collapsed, and the ground was thrown open, to be, in many instances, afterwards taken up by private enterprise and made productive.

There are in all 35 public companies connected with quartz mining, of which 23 are dividend, and 12 progressive, mines. Of the former the Clunes Quartz Company ranks the highest, the shares of which (£15 paid up) are worth £500 to £600.

Some of the reefs have proved singularly prolific, and, with one or two exceptions, the best results of quartz mining enterprise in Victoria have been obtained by private individuals.

When we read of £4000 having rewarded a fortnight's labour in one claim, of a 'pocket of quartz' yielding £10,000 in another, and of *four tons of gold,* or something

less than half a million sterling, having been taken from a third, within eight years, we are reminded of Dr. Johnson's remark on Thrale's Brewery—that it suggests "the potentiality of growing rich beyond the dreams of avarice."

When, in a drama, we witness the unexpected return of a rich uncle from the Indies, with a diseased liver, a yellow face, and "crores" of rupees, who raises the poor struggling hero of the play from indigence to affluence, we smile at the startling change, but are sceptical as to the occurrence of such abrupt transitions in real life. Yet the imagination of the dramatist is tame compared with the realities of mining experience. For instance, upon a few feet of ground adjoining that the prolific yield of which has been alluded to, the labour of, perhaps, twelve months had been bestowed, apparently without success, and the disheartened "prospectors" offered it for sale for £20, without finding a purchaser. Suddenly occurs a revolution in the wheel of fortune, and that which a short time previously was reckoned worthless, acquires a value which can scarcely be estimated.

Poverty Reef is believed to be the richest reef in the colony. Golden stone was first discovered on the surface, but it is only within the past six or seven years that systematic operations were commenced. The prospectors, Messrs. Beynon and Co., after considerable labour and discouragement, succeeding in striking the reef, which yielded variously from four to eight ounces per ton. Other claims were rapidly taken up (in some of which gold was traced from the surface), and as each touched the rich lode the fame of "Poverty Reef" spread throughout the colony.

This reef runs nearly due north and south, and dips heavily to the south. The lode consists of a series of "makings," or distinct masses of stone, each having an underlie. In the prospector's claim, for instance, a mass of sandstone, 61 feet thick, was passed through, then a body of quartz was got, 75 feet thick, a thin band of slate separating that "making" from the one beneath it, and so on. Three or four distinct masses of quartz have thus been discovered and worked. Upon one or two occasions the reef in this claim has been lost for several feet, the lode at each fresh recovery being invariably of a greater width. At a depth of between 300 and 400 feet, it is 23 feet wide, and has yielded as much as 30 ounces to the ton.*

The adjoining claim (King's) presents a remarkable instance of the good fortune which occasionally falls to the lot of individuals in quartz mining enterprise.

Abandoned twice previously, it remained for the indomitable energy and perseverance of the present owner to develop its seemingly inexhaustible wealth. It has now been successfully worked between eight and nine years, and the principal shaft has been carried down to a depth of between 400 and 500 feet, where the prospects are stated to be as good as ever.

As much as forty ounces to the ton has been taken from stone raised in this claim, the reef averaging twenty-two feet wide, but the general average of the yield is from five to ten ounces, the lode growing richer as it is carried down.

The whole of the stone, which contains a large amount of arsenical and other pyrites, is burnt on the premises previous to being crushed at the mills of the proprietor, who drives three pairs of Chilian rollers and a double battery.†

* Upwards of 50,000 ounces is stated to have been taken from the prospector's ground.

† As illustrating the richness of "Poverty," it may be mentioned that some five years ago a spare piece of ground, lying between King's and the Prince of Wales's claim, measuring about seven feet along the line of reef (the available area barely affording space for the construction of an ordinary shaft) was taken possession of and worked by a Mr. Baker, whose sharp practice, in a short time, diverted something like £10,000 from the pockets of the chagrined but powerless claimholders on each side.

The Columbian Reef, Inglewood, was taken up on the 1st December, 1859. The discoverers, Messrs. Heron and Wheeler, who had been unsuccessful in alluvial mining, were leaving the district, when they accidentally picked up some good specimens on the surface. A prospecting claim was taken up, and a vein found, which was followed down for about fifty feet, the stone at this depth yielding four ounces to the ton. In the following June they purchased a fourth share in an adjoining claim, for which they paid £4,200. A promising "leader" was struck in this claim, and being followed up, led to the discovery of a magnificently rich "pocket" of quartz, twenty-two and half tons of which yielded 2,295 ounces of gold.* This was followed by a further reduction of eighty tons of stone, which returned 3,200 ounces, or at the rate of forty ounces to the ton, and a clearly-defined lode was cut, which has since continued to prove highly productive, upwards of 20,000 ounces having been taken from this claim. No. 2 claim, on the same reef, has been almost as prolific as the former, £40,000 having been taken out in little better than twelve months, the stone averaging throughont nearly eight ounces to the ton. In No. 3 and several other claims the lode increases in width as the shaft deepens.

The Inkerman Reef, Dunolly, was first discovered by two Nova Scotians, who had been unsuccessful, and, selecting the ground for its "surfacing" indications, were rewarded by finding gold in the gravel and rubble. The course was laid open, and a quantity of rich-looking stone was raised; this was put through the Chilian mill and pounded, the proportion of gold to stone being such as to necessitate a second and third emptying of the machine in order to ensure freedom of operation; the best part of this yielded at the rate of 3,000 ounces per ton, 200 pounds of stone having produced 265 ounces of gold! From such a return it was supposed that the cap of a very rich lode had been struck, but although the yield continued to be extraordinarily good for some depth, the second and third crushings returning respectively 285 and 200 ounces to the ton, no traces of a main reef were discovered. After the upper stone had been passed through, the vein narrowed and "dipped" heavily, traversing a mass of sandstone and also of slaty rock, until at a depth of 100 feet it was comparatively a mere thread, but continued to yield a large per-centage of gold—the latest crushing, a few months back, giving upwards of 97 ounces to the ton. A fresh perpendicular shaft was now carried down to the chamber of the old workings, which struck the water level, the ground in the meantime having been worked for a year and a half. But although a recent "spread" of stone and its appearance denote a more permanent character, it is probable that no main lode will be reached under a considerable depth, the characteristics of the ground in working the prospector's claim on the "Acadian" being strongly analogous to the experience of the Mariner's Reef at Maryborough.

In the case of Wilson and Marshall's "patch" of stone at McIntyre's, symptoms of a reef abounded on the surface. This ground had been the scene of former alluvial workings, where heavy deposits were realised, and it was in searching for a primary vein that the present (1860) discovery was made. The "cement" or conglomerate containing the gold was obtained from a vertical "casing" or wall flanking the claim, and consisted chiefly of a tough, indurated schist and sandstone. This cement was thickly impregnated with gold, the material being in parts laced and held together by its massive veins. The bulk when reduced yielded upwards of 30 per cent. of pure metal—130lb weight of stone having produced nearly 500 ounces of gold. This patch was raised within a few feet of the surface, from ground forming a portion of a claim which had formerly been worked by McEvoy and party, and from which one of

* This was the largest piece of amalgamated gold ever retorted, and weighed two hundred weight.

the series of large nuggets (for which this district is celebrated) was obtained. In pursuance of the original object a shaft was sunk to the depth of 100 feet, but no traces of a lode could be discovered, and the ground was shortly afterwards abandoned.

The prospectors of Maxwell's Reef, Inglewood, obtained nearly £30,000 worth of gold during the first two years, the lode at 120 feet being 20 feet wide, and richer than the upper stone, the gold being equally distributed throughout the vein. One of the claims on the Jersey Reef lately yielded 1,065 ounces of gold, the produce of 210 tons of stone, or about £4,200 for a fortnight's work. The lowermost stone on this reef is also found to be the richest in gold.

The prospectors's claim on the Union Reef Kingower, has yielded upwards of £180,000, the lode averaging from twenty to thirty feet thick.

On the Bendigo an old Waterloo veteran and his son, whose labours extended over six years, obtained 50,000 ounces, of the value of £200,000, from forty-eight yards of the Victoria Reef and its spurs. Another party (Roberts) obtained £40,000 worth of gold from a small claim of thirty yards in length; while a third claim on the same reef gave £1,000 per yard. On the Eastern Victoria, two small parties of Germans realised £40,000 in six months. The Adventure Company, on the same reef, crushed 1,060 ounces from forty tons of stone, taken at a depth of 200 feet; and on one occasion obtained as much as 150 ounces from four buckets-full of stone.

On old man and his two sons, well known on Tarrangower, who were for a long time engaged in washing surfacing, which they wheeled down from the ranges, prospecting "nuggety reef," shortly after Dr. Lyle's casual discovery, experimented upon some surface quartz, and opened a vein, from which they realised over £100,000 in a few years.

The owners of one of the claims at Woods Point, the new field on the Upper Goulbourn, obtained, between June and December, 1863, over £40,000.

(To be continued.)

Fine Arts.

THE FINE ARTS IN FRANCE.—M. Mottez has just completed a fresco painting in the chapel dedicated to Saint Martin, in the Church of Saint Sulpice; the subject is that of the above-named Saint sharing his cloak with a poor wretch shivering in the snow. It is an admirable work, somewhat in the style of Ingres. M. Mottez was the artist employed to decorate the outer porch of the Church of Saint Germain l'Auxerrois, opposite the Louvre. A sale is announced at the Paris auction mart, in the Rue Drouot, for the 23rd instant, which includes, amongst other works of importance, a portrait of Charles VIII. of France, painted by Raphael when only twelve years of age. The Empress paid an unexpected visit to Rosa Bonheur the other day, at the residence of the latter, in the village of Thomery, and spent an hour in the atelier of the talented artist. Upon taking leave, her Majesty extracted a promise from Mademoiselle Bonheur that she would paint a picture for her visitor's private collection, and also return the visit at Fontainebleau. The Portuguese legation in Paris has announced that the execution of a statue to the memory of the late King of Portugal, Don Pedro IV., is submitted to public competition, without regard to the nationality of the artist. Five prizes are offered, one of 11,000 francs, one of 5,500 francs, and three of 2,775 francs each, and the reception of designs will end on the 31st of October.

EXHIBITIONS.—The Paris exhibition closed on the 15th instant. That of Toulouse is now open, and includes nearly four hundred works of art, of which, however, nearly one-fourth are ancient. An exhibition is just opened at Périgueux. That of Rouen commences on the 1st of October; the local authorities have voted 6,000 francs towards the general expenses, and 2,000 francs for the purchase of works of art. The exhibition will remain open for six weeks, and the artists of all countries are invited to contribute.

Commerce.

COTTON FROM JAPAN.—Three times as much cotton has been grown during the last season in Japan as there ever was before. The price of this staple, too, has tripled since it has found a market in Europe. Extensive preparations are being made by farmers for increasing their crop for the coming season.

MOTHER OF PEARL.—The brokers' circulars state that Panama mother of pearl shells are much wanted, and greatly advanced prices are offered. Good quality are fetching 23s. to 28s. per cwt.

Publications Issued.

SCIENTIFIC BIBLIOGRAPHY.—The publishers of technical works in Paris and elsewhere have been very productive of late, and some important additions have been made to the literature of the *savant*. M. Dubois, Perpetual Secretary of the Academy of Medicine of Paris, has just sent forth two octavo volumes, containing memoirs of the deceased members of that academy. M. Dubois has, for the last twenty years, given great attention to this subject, and his *éloges* present a valuable mass of biography, accompanied by sketches of the progress of contemporary science. The volumes now published contain twenty of those memoirs read by M. Dubois, in *memoriam*, before the Academy of Medicine. Another member of the same scientific body, M. P. A. Cap, has published a small volume, entitled *Etudes biographiques pour servir à l'histoire des Sciences*. M. Cap runs over the whole ground from Aristotle to Schèele, this first volume dealing with naturalists, chemists, and the medical profession; and the volume includes a chapter on forgotten *savans*, and another on the alchemy of the thirteenth century. The same author is now occupied on a complete edition of the works of the Swedish chemist, Schèele. A French translation of the well-known work entitled "Trees, their structure and growth," by Dr. Schacht, Professor of Botany in the University of Bonn, has just appeared in Paris, in one volume octavo. This translation will be welcome to those in England who are not acquainted with the German language, unless, indeed, it has already appeared in an English dress. M. Amédée Burat, of the Central School of Arts and Manufactures of Paris, has just issued a volume on "Practical Mineralogy," containing descriptions of all the mineral substances employed in construction and manufacture, whether useful or ornamental, detached as much as possible from abstruse and speculative science, in fact a practical hand-book of mineralogy for general use. M. L. Pérard, Professor of Physics in the University of Liège, and Mining Engineer, has published a volume on the important subject of the management of steam engines, entitled, "*Traité du chauffage et de la conduite des machines à vapeur fixes et locomobiles*," addressed particularly to young engineers. An important work on the nature and use of small arms, "*Cours de Tir*," has just appeared in Paris; the author is M. Chevalier de Cuverville, lieutenant in the Imperial Navy, and formerly Professor at the Naval School. The work occupies a very thick volume, with fifteen plates, and describes all the known arms which have been produced during the last fifteen years. It is especially calculated for the instruction of officers who may have to conduct musket and rifle practice. Doctor Jules Lemaire,

of Paris, who had already published his experiments on "Coal Tar," has now issued a little work on "*Phenic Acid*, its action on vegetables, animals, fermentation, poisons, and miasma, and its application to industry and to sanitary, anatomical and therapeutic science." Dr. Herpin, of Metz, has published a small volume on the subject of carbonic acid—"*De l'Acide carbonique et de ses propriétés physico-chimiques et physiques*," Baillière, Paris; M. Camille Rabaud, a small work on "Labour, its Laws and its Fruits;" M. A. Boillot, a little volume on the "Astronomy of the Nineteenth Century, with a sketch of the progress of the science from the earliest times;" and M. J. B. Belanger, Professor in the Central School of Arts and Manufactures of Paris, a "*Traité de Cinématique*."

Notes.

Railway Agricultural Exhibitions.—The Great Southern Railway Company of France contemplates, it is said, establishing, at each of the chief stations on the line, an exhibition of the products of the surrounding country. The idea is certainly novel.

Test for Vegetable Poisons.—It is said that Dr. Hellurg, of Mayence, has succeeded, after a long series of experiments, in discovering a method of detecting the slightest traces of digitaline, morphine, strychnine, nicotine, and other poisons in blood or excretions, and further of crystallising and of distinguishing them from each other by means of the microscope.

Destruction of Bugs.—It is said that a mode of getting rid of these plagues has been discovered, the means employed being dried sprigs of the plant known in France as *Passe-rage* (*Lepidium rurale*). The insects are attracted by the plant, and are said to be bound on it either dead or in a state of torpor. The discoverer certainly deserves the gold medal of the Royal Humane Society!

Discovery of a Celtic Flint Hatchet in Paris.—In turning over the soil of a garden in the *Passage des Soupirs*, near the Cemetery of Père La Chaise, the other day, a flint hatchet was found, at the depth of about 28 inches from the surface. It is in perfect preservation, and is the first known to have been discovered within the limits of the city.

French International Association for the Advancement of Social Science.—This Society, which was formed three years since in emulation of the English society of the same name, holds its meeting this year at Amsterdam. The society is divided into the following sections:—Comparative legislation; education; art and literature; charity and sanitary regulations; and political economy. The following is the programme in outline for the coming session:—1st section—1. The liberty of electors; 2. The right of accused to counsel during preliminary examination; 3. Universal commercial code; 4. Limited liability societies; 5. The treatment of foreigners in face of the law; 6. Liberty of language. 2nd section—1. Organization of middle class professsional education; 2. Literary instruction; 3. Domestic education of children; 4. Primary instruction; 5. The rights of parents with respect to education. 3rd section—1. The analytical and critical spirit in arts, and especially in painting; 2. Artistic education; 3. Realism in art. 4th section—1. The moral effect of charitable institutions; 2. Organisation of assistance in case of shipwreck, &c.; 3. Out of doors relief; 4. The abolition of quarantine; 5. The prevention of adulteration; 6. The utilisation of the fæcal matter of large towns. 5th section—1. The management of colonies, and the rights of aborigines; 2. Uniformity of money, weights, and measures; 3. Liberty of banks of issue; 4. State monopoly of railroads, canals, the post, and telegraphs; 5. The substitution of direct for indirect taxation.

The Richard Roberts Memorial.—A large and influential committee has been formed to carry out the resolutions passed at the meeting held at the Society's house on the 27th May. The attention of members is called to the notice in the advertising columns this week, and they are reminded of the eminent services rendered by the late Mr. Roberts to the manufactures of this and other countries.

Correspondence.

The Four Lions in Trafalgar-square, and some Inconsistencies in the Nelson Column.—Sir,—There are some curious incongruities about this monument, which arise apparently from no one individual's fault, but from the contributions of several. The material of the capital, at least as far as the foliage is concerned, is bronze, and the same is understood to be the case with the four collossal lions at the base, (which the public has been so long expecting); and yet the figure of the hero at the top, to whom the whole memorial is erected, (of Nelson himself), is in a stone inferior even to granite, a rag stone, it is understood! What a strange perversion this appears, especially as stone would have done very well for the lions, while the material of bronze would have afforded the veteran sculptor Baily the opportunity of giving that lightness of treatment to the surmounting figure of Nelson which it so much wants. Many must have noticed in the back view of this statue, as seen from the National Gallery, a strange coil of cable, anything but pleasing. Had this figure been in bronze, no doubt this inelegant appendage would not have been required; but it is said to have been indispensable as a support in the inferiors tone in which the statue was worked. It is also said that only two thousand pounds was paid to the sculptor for this figure, while seventeen thousand is to be paid for the four lions below. To add to the unexpected incidents of this monument also, instead of these British lions being entrusted to a British sculptor (and there are several, no doubt, who would have been ready and capable to study them well and execute them efficiently) they are being modelled by a painter, and are possibly to be cast in metal by a foreign sculptor, so that nobody and nothing in this monument, in the centre of our metropolis, seems to be in its right place; but all the art proprieties are reversed—the bronze is where the stone should be, and the stone where the bronze, and a sculptor may turn metal-founder as well as a sculptor painter! Under circumstances like these, into which such matters in this country are allowed to drift, is it wonderful that our public monuments are not unfrequently deficient?—A. F.

Captain Fowke's Monster Tent.—Sir,—Allow me briefly to reply to one or two points in a letter from Mr. Benjamin Edgington, on the subject of Captain Fowke's Great Tent in the Society's gardens, which appeared in your *Journal* of last week. Mr. Edgington says, in correction of a paragraph which had appeared in the papers, that so far from "the best tent-makers in the kingdom having been unwilling to undertake its construction," he had himself agreed to construct it. He must allow me to put him right as to this. We had hoped that he would agree to construct the tent, but when it came to settling the terms, we not only could not get him to enter into an open competition, but, failing in that, we could not even get him to tender for it by himself. He mentions that his reason for not entering into competition was because no specifications were furnished. We did not so understand it. Where a model and measurements are given, little is needed in the way of specifications. But my impression was that he declined competition on principle; that he considered he was so great and well-established a prince in his own domain that he would not condescend to enter the lists with any one. We did not find this too unreasonable, considering the high position he holds in his business, and, deferring to his caprice or whatever it may be called, invited him

to give in a tender by himself, but he declined to do so. Of course, if he assures us that it was not because of any hesitation as to the success of the tent, I am quite satisfied it must be so; but I can assure him at least that his confidence was by no means shared by his subordinates, with whom the chief communings took place, who predicted all manner of failure, a not unnatural frame of mind for those who had been all their lives employed in the construction of tents on another principle, which might be upset by the success of the interloper. Mr. Edgington says that "the result was the employment of a 'naval force of sailmakers,' an unfair use, in my opinion," says he, "of Government employés against a private tradesman." It is quite true that "the result was the employment of a naval force of sailmakers;" but it is a gratuitous assumption that they were Government employés. I acknowledge that when Mr. Edgington threw up our tent, we much wished to have the advantage of the assistance of some of the Government sailmakers, and I did apply to the Admiralty for permission to hire for a few weeks such of their sailmakers as could then be spared from the Government works; but my application was (perhaps properly) declined. In that dilemma we had recourse to the merchant service, and with the assistance of Messrs. Cowbro' and Potter, sailmakers, Minories, secured a force of naval sailmakers from private yards. Apologising for occupying your space with such small matters, I am, &c., ANDREW MURRAY, Assistant Secretary to the Royal Horticultural Society.

South Kensington, June 22nd.

MEETINGS FOR THE ENSUING WEEK.

MON. ...R. Geographical, 8½. 1. Lieut.-Col. Pelly, "On the Island of Kish and adjacent Ports in the Persian Gulf." 2. M. Vambery, "A communication respecting his Journey, in the Disguise of a Dervish, to and beyond Samarcand, through Khiva and Bokhara." 3. Capt. De Horsey, R.N., "On the Comoro Islands."
TUES. ...Medical and Chirurgical, 8½.
Zoological, 9.
WED. ...Society of Arts, 4. Annual General Meeting.
THUR. ...Chemical, 8. Mr. J. T. Way, "On the Philosophy of Agriculture."
FRI. ......Archæological Inst., 4.

PARLIAMENTARY REPORTS.

Delivered on May 21, and 23, 1864.

Par.
Numb.

Delivered on 27th May, 1864.

284. Saint Ive (Liskeard) School—Correspondence.
305. Public Debt—Account.
316. Public Works (Ireland)—Account.
320. Harbours of Refuge—Detailed Statement.
327. Harwich Harbour—Correspondence.

Delivered on 28th and 30th May, 1864.

150 (I). Prisons—Return.
304. Embassies, &c.—Returns.
325. Regium Donum—Memorial.
329. Civil Bill Forms and Proceedings (Ireland)—Return.
271. Bishops' Fees, &c.—Further Return.
300. Burmah Commercial Treaty—Copies of.
312. Turnpike Trusts—Return.
330. National Gallery—Correspondence.
332. Gold (Australian Colonies and New Zealand)—Returns.
117. Bills—Chief Rents (Ireland) (amended).
118. „ Banking Co-partnerships.
119. „ Weighing of Grain (Port of London).
110. „ Railway Companies' Powers (amended).
111. „ Railways Construction Facilities (amended).

Delivered on 31st May, 1864.

66. (IV.) Trade and Navigation Accounts.
313. Prison Discipline, &c.—Correspondence.
318. Factories—Return.
120. Bills—Juries in Criminal Cases.
121. „ Petty Offences Law Amendment.
122. „ Married Women's Acknowledgments.
123. „ Court of Queen's Bench (Ireland).

Delivered on 1st June, 1864.

186. Crown and Government Property (Westminster)—Plans.
321. Metropolitan Assessments—Returns.
323. Royal Court (Jersey)—Correspondence.

Delivered on 2nd June, 1864.

9. Game Laws—Return.
62. (V.) Committee of Selection—Sixth Report.
242. Loan Societies—Abstract of Accounts.
335. Malta and Alexandria Telegraph—Accounts.
336. National Gallery (Dublin)—Account.
124. Bills—Coventry Free Grammar School.
125. „ Sale of Gas (Scotland).
126. „ Burials Registration.
127. „ Church of England Estates.
Local Government Act (1858)—Fifth Annual Report.

Patents.

From Commissioners of Patents Journal, June 17th.

GRANTS OF PROVISIONAL PROTECTION.

Animal substances, manufacture of size, pulp, &c., from—1310—J. H Brown.
Boilers, taking up the emanations and gases from—357—J. M. Faget.
Cannons, mortars, or guns—1312—R. W. Sievier.
Carriages, construction of—1328—A. Etienne.
Cements, preparation of, for mouldings—1334—P. G. Etesse.
Coal, stone, &c., machinery for cutting—1352—W. and S. Firth.
Dough, &c., apparatus for preparing—1358—C. R. Humphrey and J. Hasler.
Engines, self-acting governors for—1263—W. Bauer.
Fire-arms, breech-loading—1344—G. Haseltine.
Fire-escape—1348—J. George.
Gas, regulating the flow of—1324—F. W. Brocksieper.
Gasaliers—1330—T. Wilson.
Gloves—1306—G. Davies.
Harrows—1326—J. Dickson.
Hygienic drawers for females—1343—F. Rochette, jun.
Lamps, &c.—1320—J. H. Burke.
Looms—1322—J. Hudson and C. Catlow.
Looms—1332—R. L. Hattersley and J. Hill.
Paper, &c., manufacture of—1335—T. Drew, sen.
Pianoforte—992—A. V. Newton.
Ploughs—1275—S. R. Dickson.
Ploughs, machinery for working—1338—C. Hall.
Pumps, &c.—1007—J. G. Jennings and M. L. J. Lavater.
Railway break, automaton—1311—C. Boutet.
Railways, fastenings for the permanent way of—1357—G. E. Dering.
Ships' anchors—905—T. C. Jones.
Ships, propellers for—1356—J. Taylor.
Ships, protecting the bottoms and sides of—1285—C. P. Coles.
Stencilling, apparatus for—1364—J. Sykes.
Sugar, treatment of low or poor products from—1342—W. E. Newton.
Surface condensers—1318—G. T. Bousfield.
Teeth, artificial—1346—G. Davies.
Tell-tales—1340—W. Smith.
Wheel tyres—1316—J. Whitley and D. F. Bower.
Yarns and fabrics, singeing—1360—H. Ambler.

PATENTS SEALED.

3220. E. Wilson and G. Lindsley.	3247. W. E. Gedge.
3229. V. B. FitzGibbon.	3259. N. Lloyd and E. Hargraves.
3234. J. Sainty.	3274. T. Hall.
3236. R. A. Brooman.	23. A. L. Le Harivel.
3238. W. E. Gedge.	33. J. Kidd.
3246. J. Ronald.	58. B. Samuelson.

From Commissioners of Patents Journal, June 21st.

PATENTS SEALED.

3248. J. Knowles.	10. J. L. P. Duroy.
3249. J. Mathew.	57. P. Walters.
3254. S. B. Ardrey, S. Beckett, and W. Smith.	82. W. E. Newton.
3257. H. Barber.	121. W. C. Rogers.
3267. R. A. Brooman.	262. W. Clark.
3268. J. D. Bryant.	332. J. Webster.
3278. W. Wilson.	348. A. V. Newton.
3282. J. B. Cronin.	414. H. Y. D. Scott.
3290. H. Caunter.	792. R. Douglas.
3292. J. Cumming.	794. R. Douglas.
3294. J. M. Vanderfeesten.	838. T. Brown.
3304. J. Starkey, J. Haworth, and J. K. Phippin.	864. R. Douglas.
3306. J. Clegg.	1022. A. V. Newton.
	1046. Sir C. Fox.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1533. G. Leach.	1584. J. Fletcher & J. W. Fuller
1534. H. J. Kennard.	1640. J. Cowan.
1552. W. and J. Todd.	1580. J. F. Williams.
1539. F. Potts.	1587. H. Lawford.
1547. T. Mellodew, C. W. Kesselmeyer, & J. M. Worrall.	1592. C. Hodgson.
1562. A. W. Gibson.	1593. C. Hodgson.
	1621. W. Clark.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1681. W. E. Newton.	1713. T. Spencer.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, JULY 1, 1864. [No. 606. Vol. XII.

Proceedings of the Society.

Presentation of Medals and Prizes.

The Presentation of the Medals and Prizes awarded during the present Session, took place at Willis's Rooms, King-street, St. James's, on Friday, the 24th inst., at 3 o'clock. His Royal Highness the Prince of Wales, President of the Society, presided.

Mr. Wm. Hawes (Chairman of the Council) in opening the meeting, said it devolved upon him, in virtue of the office which he held, to introduce to them the business which had caused them on this occasion to have the honour of the presence of His Royal Highness and the pleasure of meeting so large a company of the members of the Society. They were no doubt all aware that the object of the Society, for more than a hundred years past, had been to reward, by means of medals and other tokens of honour, those who had endeavoured to advance Art, Science, and Manufactures; that for a great number of years past they had met and distributed those medals; that they had, in the words of their ancient documents, "encouraged the study of the polite arts among the higher classes of society;" and that, having performed that duty for many years, and other societies having, to a certain extent, taken their place amongst those classes, it had now fallen to their lot to endeavour to promote the same objects amongst other classes for whom it was calculated they could do as much good as they had already done in connection with the higher classes. They were aware that as regarded Art, the exhibitions of the Royal Academy took place in the rooms of the Society, until the growth of that body led to their exhibitions being held in rooms appropriated to that branch of art by the Crown; that manufacturers had received encouragement by rewards and medals given for meritorious inventions; and that they had done their best to promote the interests of commerce by collecting from all parts of the world the products of every country, and endeavouring to introduce them for the benefit of the manufacturing districts of the country, and to the advantage of the whole world. In every branch, whether of Art, Science, or Manufactures, some distinguished individual would this day be brought before them to receive the medals and prizes of the Society; and he was quite sure it would afford as much pleasure to the members present to take part in these proceedings as it did to the Council to award medals and prizes to so many distinguished individuals, who not only did honour to the Society but to the country. With these brief remarks, he would now ask His Grace the Archbishop of York to introduce the first prizes on the list, viz., the Educational Prizes awarded during the past year.

The Archbishop of York said, in the unavoidable absence of Earl Granville he had been called upon suddenly to introduce the first set of prizes to be distributed at this meeting. Some years ago this Society undertook, for the members of Mechanics' and similar Institutions, a work which was performed for another class by the universities—the work of encouraging them in the acquirement of knowledge, by holding periodical examinations and awarding certificates and prizes. He had had the honour of acting as an examiner to this Society for some years, indeed as long as his leisure permitted. He had also had some experience in the middle-class examinations of the University as well as in university examinations generally, and he was therefore in a position to say—and he ought not to forbear to say it—that the work done by the candidates in connection with these Institutions was equal in its quality to the work done by any other class of students whatever. He thought, in point of precision of thought and excellence of language, the papers he had looked over left hardly anything to be desired. This undertaking on the part of the Society commenced several years ago. The number of candidates the first year was only 52; the number last year had been upwards of 1,000; which was sufficient to show that this Society had supplied an important want. It was to be remarked that the candidates who would come before His Royal Highness to receive the prizes had obtained them not as against the candidates of one locality alone, but against all comers from all parts of the kingdom, and thus the honour was the greater. One special prize had been given by his Royal Highness the Prince Consort. That was a name never to be mentioned without deep respect in any meeting of Englishmen at any time, but especially in the Society of Arts, where it could not but move the deepest feelings of gratitude, because it was a matter of fact that the Society mainly owed its present state of activity to the fostering care and unvarying interest of his Royal Highness. This prize was awarded to the candidate who in the present and three preceding years had obtained the largest number of first-class certificates, and by reference to the list they would see that the person to whom this high honour was awarded this year had well deserved it, judging by the number of subjects in which he had taken the leading place. He himself examined that candidate's papers in 1861, and he then formed a very favourable impression of them. He should best consult the convenience of his Royal Highness, and that of the meeting at large, if he stopped at this point; and having stated these few facts in connection with the examinations, he now begged to introduce to the notice of his Royal Highness the successful competitors for the prizes.

His Royal Highness then distributed the educational prizes (first and second), together with the Prince Consort's prize of twenty five guineas, in accordance with the list which has already appeared in the *Journal*.*

The Marquis of Salisbury said he had been desired to introduce to the notice of His Royal Highness the successful competitor in the designs for Dwellings for the Labouring Classes. He wished this duty had fallen into abler hands. It was a subject which had occupied the attention of the public lately to a considerable degree. Many attempts had been made to accommodate the dwell-

* Vol. XII. p. 503.

ings of the poorer classes to their wants, both as to decency and comfort, but he was sorry to say they had not yet been able to supply the labourer with a suitable residence at a rent which came within his means. He hoped, however, the interest that had been taken in the subject by the Prince Consort, as well as by his Royal Highness now in the chair, would tend to direct the attention of all to so interesting a department of our social economy. The number of competitors for this premium was no less than 107, and out of that number one had been selected as deserving of the prize, and it would be regarded as no small merit to be the successful candidate in so very large a competition. This was a subject on which much might be said on behalf of the public and the labouring classes, but he would confine himself to these few remarks in introducing to the notice of His Royal Highness Mr. John Birch.

His Royal Highness then presented to Mr. Birch Mr. J. Bailey Denton's Premium of £25, and the Society's Silver Medal for the Best Design for a Labourer's Cottage.*

Mr. W. H. Bodkin (Assistant Judge) then rose and said, the next subject in the order of proceedings was one which would be considered of great interest. Amongst the many objects of utility entrusted to the care and management of this Society there was a bequest which enabled them every fifth year to award (in conjunction with the College of Physicians) the splendid silver cup they saw before them, worth £100, "with gold coin in it to the same amount," for the best treatise upon Jurisprudence. Many learned works came under the consideration of the judges, and after giving to all the degree of attention which each merited, the prize was unhesitatingly awarded to Henry Sumner Maine, LL.D., late Professor of Civil Law in the University of Cambridge, and now a member of the Supreme Council of India, for his work on "Ancient Law."† That treatise, a copy of which would, with his Royal Highness's permission, be forwarded to him, would, if he condescended to peruse it, satisfy his Royal Highness that the author of it had shown great talent and great research, and produced a work, not merely valuable to the professional jurist, but to all who took an interest in the progressive civilisation of mankind. The Council would have been glad to have had the pleasure of seeing Mr. Maine present to receive the cup from the hands of his Royal Highness; but considering the high position which Mr. Maine had recently been called to fill, his absence on this occasion would not perhaps be considered a matter of regret. As a member of the Supreme Council of India, he was now giving the benefit of his acquirements and talents in the government of that mighty empire, which, under the beneficent and undivided sway of Queen Victoria, was advancing with such marvellous strides, not merely in material prosperity, but in all those arts and sciences which tend to make a people happy and a nation great. Mr. Maine was represented on that occasion by his brother, who would receive on his behalf the reward that had been so properly bestowed; and whatever real gratification the award of that prize would afford to the author of the treatise or his representative, no doubt could be entertained that both would consider it of enhanced value from the honoured medium of its presentation.

His Royal Highness then presented the prize to the Rev. Lewin G. Maine, as the representative of his brother.

Sir Frank Crossley, M.P., said he had been requested by the Council to say a few words in introducing to his Royal Highness the successful competitors for the Art Workmanship prizes; and it might be necessary for him to state, to those who were not informed on this subject, that the Council of the Society had thought it wise to prescribe the design from which all the competitors in each particular class should work, instead of allowing each competitor to select his own design. They had also, as the Archbishop of York had stated with regard to another class of candidates, to compete, not merely with those from any single town or district, but with all comers throughout the kingdom. The works sent in for competition were submitted to judges of the highest standing and the strictest impartiality, and there was doubtless great credit due to the successful competitors. That lamented Prince whose name could never be mentioned without feelings of the deepest regret—the Prince Consort—had taken the deepest interest in the progress of Art Workmanship, and there was no doubt that the institution of these prizes would do much to raise this country to that high position in industrial art which it ought to occupy from its great wealth and intelligence; for after all it was useless to produce good designs if they did not find artizans in this country who had the ability, the zeal, and the perseverance to carry them out with effect. It depended upon the style of workmanship in a production whether it was a thing to be admired as long as it endured, or was merely a showy object, causing pain to men of true taste when closely examined. He rejoiced to find that the Prince Consort had left a noble son who was treading in his footsteps. His Royal Highness showed this by his presence here to-day; it was also proved by his presence amongst the hives of industry in the manufacturing districts; and he (Sir F. Crossley) must say he was much delighted when, last year, he had the honour of showing his Royal Highness over the works with which he was connected, to find that whilst he entered minutely into the details of the various manufactures, almost the first thing he inquired was how it fared with the thousands of workpeople, and what wages they were able to earn? Happy were the people when their princes were concerned about the welfare of the many rather than about the interests of the few. They saw the Scripture well nigh fulfilled that day, "Seest thou a man diligent in his business? he shall stand before kings: he shall not stand before mean men."

The prizes for Art-Workmanship were then distributed by his Royal Highness, in accordance with the list already published in the *Journal*.*

Mr. M. H. Marsh, M.P., said he had been selected to introduce the next subject for which medals were awarded by the Society, from having been intimately connected with the colonies. They were all aware of the great commercial value of gutta percha. It was a material which had been introduced only within the last few years, and it was now of most extensive application. It was used for objects of great variety of character, from the halfpenny toy of the child to the great electric telegraph which could waft a sigh from India to the Pole, defying space and time, and which was one of the greatest discoveries of a great age, when mind triumphed over matter in a way that no previous age had witnessed. Gutta-percha was a natural production; its sources of supply were limited; the trees from which it was derived were continually cut down, and the supply must ultimately fail, and hence the importance of discovering some efficient substitute. The eminent colonists to whom the Society's medal was awarded had been fortunate, the one in discovering and the other in introducing into commerce a gum of another kind, which could be used as a substitute for gutta-percha, and he was sure the meeting would agree that they were eminently entitled to the distinction which was now conferred upon them. A medal had also been awarded to Mr. J. C. Morton, the eminent authority in agricultural matters, for his meritorious paper "On Agricultural Progress," read before the Society last session.

His Royal Highness then presented the silver medals awarded to Dr. Van Holst, of Berbice, for the importation into this country, through Mr. Walker (Colonial Se-

* Vol. XII. p. 401. † Vol. XII. p. 145.

* Vol. XII. p. 75.

cretary of British Guiana), of specimens of "Balata," a gum from the *Sapota Mulleri*, as a substitute for Gutta Percha; and to Sir William Holmes (of British Guiana), for the introduction of this material into the commerce of this country; as well as one to Mr. John Chalmers Morton, for his Paper "On Agricultural Progress, its Helps and Hindrances." The first two medals were received by Mr. Winkworth on behalf of the above-named gentlemen.

Mr. William Hawes said—In the few observations he made at the opening of the meeting he had stated that prizes would be given to representatives of Arts, Manufactures, and Commerce; but the medal he had now to refer to was to be presented to a gentleman who had done in a particular way more to promote Arts, Manufactures, and Commerce—all three combined—than any other individual, he believed he might say, of the present day. The medal he had to place in the hands of His Royal Highness was one specially dedicated by this Society to commemorate the great benefits it received from the services and from the support of the Prince Consort, and was the first of the series. It was the gold medal of the Society, executed by Wyon, and he believed was the best representation of the Prince Consort which had to this time been executed. In every way it was the desire of the Society to confer this medal only in recognition of very high merit. The Council of the Society had therefore selected Sir Rowland Hill, the originator of Postal Reform, to be the first upon whom they would confer the distinction of presenting, through the hands of His Royal Highness, the Albert Gold Medal. (This announcement was received with enthusiastic applause throughout the meeting.) It was a remarkable circumstance connected with postal reform that for the last 200 years every reform, every step in the direction of progress which had been made, had been originated and carried out by individuals emanating from the mercantile and trading classes of society, who had forced upon the authorities that attention to the interests of commerce by which alone it could prosper. If they went back two hundred years they found individuals contracting to carry letters by relays of post horses. In 1683 an upholsterer started a penny post in London, and a quaker at Exeter contracted for the conveyance of letters between the West of England and Chester, to meet the Irish mail. Mr. Robert Palmer, a citizen of London, was the first great contractor for the mail service, as it existed before the construction of railways. Then they came to the period which most present recollected, when the rates of postage were high, and but few facilities for correspondence existed, and when Sir Rowland Hill propounded that most extraordinary scheme of postal reform which had not only received the unanimous sanction of this country but had since been adopted by nearly every civilised country in the world. The great features of Sir Rowland Hill's plan were these—equal rate of postage—the penny—the prepayment of that penny—and the charge by weight instead of what was called the double and treble letter. Those three propositions being established in the public mind—those three principles being admitted, every other portion of postal reform followed as a consequence of their adoption. Sir Rowland Hill was undoubtedly the first to originate them; and so clearly did he at first enunciate his plan and explain its details that no man had been found to dispute that to Sir Rowland Hill, and to no other person, belonged the sole honour of this great social and political reform. In order to give an adequate and clear idea of the importance of this great measure, he might state that while the number of letters which passed through the Post Office, when this reform was introduced was about 75,000,000 per annum, it had risen in the course of a few years to nearly 700,000,000; that the number of miles travelled by post daily had risen from 3,000 to nearly 16,000; that the weight of letters had increased from 700 tons to nearly 5,000; that by the book-post, which only dated from the year 1848, when only 750,000 packets passed through the post, there were now conveyed the enormous number of 12,000,000; and that grand completion of the system, the Money Order Office, had increased from £313,000 to £16,500,000 last year. They might truly say that, whilst they boasted that in this country laws were made for all classes—for the rich and poor alike—never, until Sir Rowland Hill's time, was the post-office the post-office of the poor. It was now essentially the post-office of the people, who could maintain their family ties and their family associations, and by means of photography could be in possession of family likenesses at a cost so trifling that every member of the community could enjoy them. Nothing, then, but the greatest amount of good could arise from such facilities being afforded for the social, moral, and industrial improvement of these classes. He might further mention, as a remarkable fact, that the number of letters now passing through one of our large cities—Manchester—was more than equal to the whole of the postal correspondence of the great empire of Russia. It would be difficult to illustrate the effect of the system more strikingly than by the fact that, in a district with less than one million of inhabitants there was a greater amount of correspondence than existed amongst the millions of people who inhabited that great empire. But there was another remarkable feature connected with it. Not only had this system been adopted by Great Britain, but nearly every civilized country had copied it. They found that in no fewer than 34 British colonies the penny postage system had been introduced, and besides that there were 45 foreign countries and states in which not only was the postage a penny, but the prepayment by stamps—a most important part of the system—was also introduced. He had begun by stating that in the prizes they had already awarded, the Society testified its anxiety to promote in the best possible manner the interests of Arts, Manufactures, and Commerce. He wished them to receive Sir Rowland Hill as representing in his person Arts, Manufacturers, and Commerce. He wished them to receive him on this occasion as one of the great benefactors of the age—as one to whom the Society's Albert Gold Medal, which was to be awarded to those only who had in the highest degree promoted Arts, Manufactures, and Commerce, was most appropriately adjudged. He wished them also to show that in the opinion of all present he had done his country service—that he had earned an imperishable name, and that he would hereafter he looked upon as one of the greatest civilizers of the age. All present, he was sure, would with him desire that the great power Sir Rowland Hill had called into being would be used for no other purposes than those its founder contemplated, viz., as the great promoter of peace among mankind, and as tending to bind the interests of this country, more closely than could be accomplished by any other means, with those of every other country in the civilized world.

His Royal Highness, in presenting the Gold Albert Medal to Sir Rowland Hill, expressed the great gratification it afforded him to be the medium of conveying so valuable a recognition of the services of so distinguished a man.

Sir Rowland Hill (who was loudly cheered on rising) said he must ask leave to express his thanks for the high honour this day conferred upon him. The award of the medal of this important and influential Society would, under any circumstances, confer high distinction and excite the most grateful feelings; but that distinction was increased, and those feelings were strengthened by the consideration that, as had just been stated to them, the medal thus awarded him was founded in memory of that great and good Prince, whose loss the nation so deeply deplored; and his gratification was enhanced by the fact that the medal had been so graciously presented by His Royal Highness. This medal, precious to himself, would also be treasured by his family, and in their name, as well as in his own, he begged to tender to

His Royal Highness, to the Council, and to the Society at large, his most respectful and heartfelt thanks.

Lord Henry Lennox, M.P., said the grateful task had been confided to him of proposing a vote of thanks to His Royal Highness for the honour he had conferred upon them in presiding over these proceedings. The presence of His Royal Highness amongst them that day, in the first place showed to the Society of Arts that our gracious Queen preserved that interest in the proceedings of the Society which had been so often alluded to as having been felt by her revered husband, the Prince Consort; and, secondly, it was an earnest to the country that His Royal Highness now in the chair was anxious to tread in the steps of his father, and to throw the shield of his powerful name and influence over all societies like this, whose only object was to promote the happiness and welfare of mankind. This occasion was specially interesting from the fact that this was the first time His Royal Highness had occupied the chair of the Society which he had honoured by becoming its President; and he (Lord H. Lennox) was sure he expressed the wish of the members at large when he said he hoped this was only the first of many succeeding occasions on which the Society might have the honour of being presided over by His Royal Highness the Prince of Wales. In the name of the Society of Arts, and by the unanimity of their vote, let them assure His Royal Highness that by this and other similar acts he was winning for himself a high place in the affections of the people of this country, which had been so warmly and justly bestowed upon his illustrious father and upon our beloved Queen.

His Royal Highness the President (who on rising was loudly cheered) said—My lords, ladies, and gentlemen,—It would be unbecoming in me, after what has just fallen from my noble friend, not to say a few words to express my thanks, and I do thank you most sincerely for having invited me on this occasion to present these medals and prizes. When I was first asked to accept the office of President of this Society I felt great doubt about doing so, feeling that owing to my age, I must appear to be an unworthy successor of my revered father, one of whose great objects in life was the promotion of science and the arts. Still, after the kind manner in which I have been received here to-day, I can only say it has afforded me great gratification to have taken part in your proceedings, and I shall be glad to do so again, whenever I am able, on occasions of this kind, in fact on all occasions when I feel that I may be doing service to the country. I will only say further that I cordially wish prosperity to all those to whom I have had the pleasure of presenting these prizes.

His Royal Highness then retired, and the proceedings terminated.

Annual General Meeting.

The Annual General Meeting for receiving the Report from the Council, and the Treasurer's Statement of Receipts, Payments, and Expenditure during the past year, and also for the Election of Officers, was held, in accordance with the Bye-laws, on Wednesday, the 29th inst., at 4 p.m. William Hawes, Esq., Chairman of the Council, presided.

The Secretary having read the notice convening the Meeting, the minutes of the last Annual General Meeting, and of the subsequent Special General Meetings, were read and signed.

The Chairman then nominated Mr. Philip Palmer and Mr. B. Waterhouse Hawkins as Scrutineers, and declared the ballot open.

The Secretary then read the

Annual Report of the Council.

In compliance with the bye-laws of the Society, the Council now lay before the members in annual meeting assembled, a statement of their proceedings since the last meeting.

President.

In the Address of the Chairman of the Council at the opening of the Session in November last, it was announced that His Royal Highness the Prince of Wales had been elected President of the Society, and it gives the Council great pleasure now to record, that His Royal Highness was graciously pleased to inaugurate his Presidency by presiding at the General Meeting of the Society on Friday last, and presenting the Prizes and Medals which had been awarded in the course of the past year.

Cantor Lectures.

The Cantor Lectures, also referred to in the Chairman's Address, have proved a very great success, such as fully to justify the Council in the course they adopted; and they strongly recommend to the consideration of their successors the propriety of continuing these lectures next season. The subjects selected for the Courses this season were:—

"The Operation of the Present Laws of Naval Warfare on International Commerce." By G. W. Hastings, Esq., Barrister-at-Law.

"Fine Arts Applied to Industry." By W. Burges, Esq.

"Chemistry Applied to the Arts." By Dr. F. Crace Calvert, F.R.S.

The greatest interest was evinced by the members; indeed, on many evenings the room was not large enough to contain those applying for admission.

Alterations, Repairs, and Library.

On the renewal of the Society's lease the Council took into consideration how they could adapt the house to the better accommodation of the increased number of members, and they had plans and estimates prepared, which, as soon as the meetings of the Society were over, were put into execution. The meeting-room of the Society has been enlarged by rendering the ante-room available, which, with the re-arrangement of the seating, gives accommodation for a larger audience, whilst the ventilation is greatly improved, adding materially to the comfort of those attending the meetings. The crowded meetings which have taken place on the occasion of the Cantor lectures, as well as on the Wednesday evenings, have fully tested the value of the alterations, and the

results have been most satisfactory. The model-room has been converted into a library, where the Society's books have been carefully arranged for the use of the members, and the room itself rendered available as a reading-room, while at the same time arrangements for the display of the Society's models have not been omitted. The Council may take this opportunity of reminding the members that the library is a lending library, and that, with some necessary exceptions, all the books are available for borrowing by the members. A catalogue in MS. has been prepared for consultation by members, which at present it is not intended to print, it being thought better not to incur that expense until the library has been rendered more complete by the purchase and addition of other works. From the income of the Cantor bequest, the greater part of which it is intended to apply to the payment of the Cantor Lectures, the Council have apportioned £50 per annum, to the purchase of new books, on subjects connected with, or illustrative of, Arts, Manufactures, and Commerce.

The Barry Pictures.

Under the advice of Mr. Richard Redgrave, R.A., who examined and reported on the condition of these pictures, they have been lined and put upon new and stronger frames and stretchers. This work, requiring great skill and care, has been most successfully accomplished by Mr. Merritt, and the result reflects great credit upon that gentleman. The thanks of the members are due to Mr. Redgrave, who, at no expense to the Society, gave them the benefit of his knowledge, and much valuable time in examining and reporting on the condition of the pictures, as well as in superintending the work of repair in the hands of Mr. Merritt.

Prizes.

During the session the prizes offered by the Society to Art-workmen have been awarded, the Judges being Richard Redgrave, R.A., M. Digby Wyatt, and John Webb, Esqrs. There were seventy competitors, and the prizes were awarded in nearly every division of the subject. The judges expressed great satisfaction at the manner in which the Society's offer of prizes had been responded to by the workmen, and in several cases the quality and character of the works sent in was so meritorious, that extra prizes were recommended, and the Council had great pleasure in following the recommendation of the judges. The success which has attended this first competition has induced the Council to draw up a more extended list of subjects, and to offer prizes for a second competition, amounting to upwards of £500; the works to be sent in by the end of November of the present year.

The Albert gold medal, established by the Society as a memorial of the Prince Consort, to be bestowed for distinguished merit in promoting Arts, Manufactures, or Commerce, has been awarded for the first time, and Sir Rowland Hill, K.C.B., receives it in recognition of his great services to Arts, Manufactures, and Commerce, in the creation of the Penny Postage and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world.

One only of the prizes offered through the Society by R. Bailey Denton, Esq., for designs for Labourers' Cottages, has been awarded—namely, £25 and the Society's Medal—to Mr. John Birch. The object of the prize was a Labourer's Cottage, to consist of a living-room, scullery, and three bedrooms, of a suitable character, to be built at a cost, with profit to the builder, not exceeding one hundred pounds each. By the conditions of the competition the Judges were to be, an architect, a land agent, and a builder, and those duties were undertaken respectively by C. F. Hayward, Esq., John Clutton, Esq., and George Dines, Esq., to whom the Society is greatly indebted for undertaking the responsibility of a work involving great labour and the expenditure of much valuable time. There were 107 competitors sending in 134 designs. The judges report that after careful and minute examination of each design and specification, there was not one which strictly complied with the condition as to price; but they nevertheless considered one of the designs to have so much merit that although if the conditions were strictly adhered to, it could not claim the prize, they strongly recommended that the prize should be given to the author of that design. On communicating this recommendation to Mr. Bailey Denton that gentleman at once concurred in this view, and the Council awarded the prize and the medal to Mr. John Birch.

The Council refer the members to the report of these gentlemen, printed at page 401 of the present volume of the *Journal.*

The Swiney Prize, given by the will of the late Dr. Swiney, a silver cup of the value of £100, with gold coin in it to the same amount, to the author of the best published treatise on Jurisprudence, to be awarded on every fifth anniversary of Dr. Swiney's death, has been this year awarded to Henry Sumner Maine, Esq., LL.D., late Professor of Civil Law in the University of Cambridge, and now Member of the Supreme Council of India, in respect of his work entitled "Ancient Law."

The Council have had brought under their consideration a material, the product of a tree (the *Sapota Mulleri*) in British Guiana, termed *Balata,* which is of the nature of gutta percha,

and may be used with, or as a substitute for, that material. Some small specimens, collected by Dr. Van Holst, in British Guiana, were originally brought before the Society, in 1860, by Mr. William Walker, the Colonial Secretary for that colony, and subsequently Sir W. Holmes, Commissioner of that colony at the Exhibition of 1862, has exerted himself to procure the material and prepare it in the country for export in considerable quantities as a matter of commerce. The qualities of the material have been carefully examined and tested by manufacturers, and the Council have thought it right to mark their sense of the importance of the labours of the above-named gentlemen by awarding to each of them the Society's Silver Medal—to Dr. Van Holst for the discovery, in British Guiana, and the first importation of the specimens, and to Sir W. Holmes for his exertions in introducing the material into the commerce of this country. In the *Journals* of the 24th of August, 1860, and 4th of March, 1864, will be found Mr. Walker's and Sir W. Holmes's communications.

The Council have awarded to John Chalmers Morton, Esq., the Society's Medal for his paper read before the Society, "On Agricultural Progress; its Helps and its Hindrances."

The Prize of £70 offered, through the Society, by Sir Walter Trevelyan, for the discovery of a process for preserving fresh meat better than by any method hitherto employed, applicable to the preservation of meat in countries where it is now almost valueless, so as to render it an article of commerce and available for stores on shipboard, has not been awarded. Several ingenious processes for the purpose have come before the Council, one of which was described in a paper read before the Society at one of its evening meetings, and the method adopted was shown practically before the members in illustration of the paper. In processes of this character it is impossible to arrive at a just conclusion as to their merits without an actual trial over a lengthened period, and as specimens of meat preserved by these various methods are being put to the test of experiment both in the English and French Navies, it has been thought right to postpone giving any judgment on their merits until the results of these trials shall be known.

"Journal."

At the commencement of the Session the Council took into consideration how far any improvement could be introduced into the *Journal*, and, under the direction of a committee, appointed specially for this purpose, certain changes in the form and matter of the *Journal* have been introduced, which it is believed have rendered it more interesting to the members. It must, however, be always borne in mind that the *Journal* is not a newspaper, but a medium of recording the operations of the Society, the papers read at the evening meetings, and the discussions which follow; in fact, what in other Societies is comprehended under the term "Transactions." These topics must form the principal subject matter of the *Journal*, and all other matter must be subordinate to it, and must vary in amount according as the transactions proper admit of space for its insertion. This supplementary matter has been divided, under the heads of Arts, Manufactures, Commerce, and the Colonies, the object being to give to the members as much information and news under these divisions as space will permit. To these have been added obituaries of members and other individuals worthy of note, whose lives have been identified with any of the objects for the promotion of which the Society has been established. There is also space devoted to correspondence. The Council would suggest to the members how much it would add to the interest and value of the *Journal* if members would take the opportunity of sending to the editor such information in these respective departments as must be at their command. Such communications need not necessarily be lengthened notices; short and condensed notes would be acceptable when it might not be convenient to send long communications.

Dwellings for the Labouring Classes.

The offer of prizes by Mr. J. Bailey Denton, for designs for a labourer's cottage, to be built for a sum not to exceed £100, as well as the discussion on Mr. Morton's paper, and the statistics of model dwellings collected by the Society's Committee, under the chairmanship of Mr. Twining, and published at the expense of that gentleman, drew the attention of the Council to the subject generally of dwellings for the labouring classes, and it was thought desirable to hold a Conference upon it, to which all who took an interest in the subject should be invited, and, accordingly, two days in the month of May were devoted to a discussion of the subject in all its bearings. The Conference was well attended, and resolutions of a practical and useful character were passed. The particulars of the Conference have already appeared in the *Journal*. It is hoped that the new Council will take up the matter and endeavour to carry into effect, as far as possible, the spirit of the resolutions then passed.

Society's Memorial of the Prince Consort.

The bust of His Royal Highness the Prince Consort, by Mr. Theed, has been placed in the Society's Rooms, and the Pictures undertaken by Messrs. Cope, R.A., and J. C. Horsley, A.R.A., are in the course of execution.

Institutions in Union.

The proceedings in this branch of the Society's

operations are detailed in the Secretary's Report read at the Conference of the Institutions held on the 16th instant.

CONVERSAZIONE.

A Conversazione took place at the South Kensington Museum on Thursday, the 16th instant, when upwards of 3,300 members of the Society and their friends were present.

FINANCE.

In the last *Journal* is printed, as required by the bye-laws, the accounts of the Society for the year ending the 31st May, 1864. On these the Council have only to observe that the large items of expenditure have been upon the repairs and alterations in the house and on the Jury Reports of the Exhibition of 1862. It must be borne in mind that in the last two years the Society has renewed the lease of its premises at a cost of £2,360, and has had to spend in alteration, repairs, and new fittings and furniture—which had been delayed until it was settled that the lease of the premises would be renewed—a sum of £2,400, making an extraordinary expenditure of nearly £5,000, which cannot fairly be charged upon the revenue of one year only, but should be spread over the whole term of the lease. Under these circumstances, the Council feel that they may congratulate the Society on the prosperous condition of its finances.

Mr. WINKWORTH moved the adoption of the report, which was seconded by Professor TENNANT.

Mr. PHILIP WRIGHT wished to make a few remarks upon the accounts. He had done so on the occasion of the last meeting, when it was acknowledged by the gentleman now in the chair that the spirit in which his observations were made was fair and courteous, and he trusted it would be the same on the present occasion. He admitted there was some impovement in the form of the accounts over that of last year. They had now a statement of what were Trust Funds, and so far there was an improvement, but in some other respects he thought the accounts were rather less clear than before. In the Receipts and Payments the accounts last year were divided into establishment expenditure, general expenditure and special expenditure; but having, on the last occasion, expressed his surprise at the different heads under which the auditors had placed various items of the expenditure, he found in the present accounts the heads were left out altogether. It would be observed that in some cases the Society had to deal with monies of which they had the sole control as regarded both principal and interest; in other cases they had control over the interest only; in other instances the application of the interest was specified; and in other cases again they acted simply as bankers for other parties. Now, in the receipts and payments all these things were huddled together, which he submitted ought to be kept distinct. The Swiney bequest was stated in the present accounts as £4,500 in Consols; the last time any notice was taken of that bequest it stood as £1,333 6s. 8d. The gentleman who acted as treasurer now was an auditor last time, but that item had jumped from £1,333 6s. 8d. to £4,500 without any remark or foot-note to explain how it was so. On calling at the office he was informed that £4,500 was the amount of the Swiney bequest, and that every five years the sum of £200 was appropriated in the special manner indicated by the testator. With that exception it appeared the Society had the entire control of the interest arising from that bequest. With respect to John Stock's bequest of £100, it seemed that for a very long time past the interest of that money had been applied to the general purposes of the Soeiety, and it was only lately that the special objects for which that bequest was made had come to light. The Fothergill trust was pretty much in the same condition, though he believed the object to which that money was devoted was the establishment of a medal for the best preservations against destruction by fire. He had never heard of that medal being awarded. The Cantor bequest came into the hands of the Society two years ago, and he thought it would be found they owed to that fund an amount of about £300, which he presumed the council would ultimately replace to that account. It would seem that this year a portion of the interest of that sum had been applied to the specific purposes for which it was intended, and that besides the lectures, £50 had been expended for books added to the library. He did not think it right to include that in the general accounts. The interest arising from the trust funds ought to be distinctly stated, and the general fund and the interest applicable to it ought to be stated with equal distinctness. The treasurer and auditors, in their anxiety to put the accounts in a condensed form, had rendered them extremely confused. In the case of the South Australian Institute, for whom the Society acted as bankers, he found in the statement of liabilities and assets as regarded that Institute, a sum of £12 4s. 8d. against the Society; last year it was about £36; whereas by the general receipts and payments he found that the Society had received on account of that institute £350, and had expended on the same account £429 3s., from which he gathered that the institute was indebted to the Society, whereas the contrary appeared to be the case. Then again there appeared to be a liability of £26 5s. on account of the Prince Consort's Prize, which he confessed he could not understand.

The SECRETARY explained that the amount received last year was for the previous year, but the amount of the prize had not been received for the present year.

Mr. WRIGHT added—Having touched upon the form of the accounts, he could not congratulate the Society upon its financial position, inasmuch as the accounts showed that at the present moment the Society was bankrupt; an honourable bankruptcy, it was true, for if they were called upon at once to discharge all their liabilities they could do so, but it must be by the sale of their property. They had spent in round numbers £5,000 for renewal of the lease and repairs, whereas the value was set down at £3,000; so that if in the last two years they had sunk £2,000 on that account, he did not see how in the course of the lease they were to get back the whole sum expended, as the report of the Council promised. He thought this showed a bad state of the funds. He would strongly urge on the treasurer and auditors in future to keep the general account quite distinct from the special and banking accounts. There was one item in the expenditure which called for some notice—that was with regard to the Conversazione. He thought it would have been better if, in the present state of the Society's funds, such an expenditure had not been incurred. The invitations were issued by the Council, in their own name; and as the honour of the thing reflected upon them, he thought it only reasonable that they should pay the expenses of the entertainment. Mr. Wright concluded by expressing a hope that the accounts would in future be more specifically rendered; and he suggested that the form of accounts adopted by the Society for the Propagation of the Gospel, which had to do with different funds in a similar way to this Society, might be adopted with benefit.

The CHAIRMAN asked whether any other member wished to offer any remarks upon the report and accounts. After a pause, and no member rising, the Chairman said, before putting the adoption of the report, it might be considered

that some reply was due from him to the observations of Mr. Wright, and he would say at the outset, that so far from that gentleman's criticism of the accounts being unpleasant to the Council, they felt obliged to any member who brought an independent mind to bear upon the subject, with a view of suggesting any improvement as to the mode in which the financial statement should be made out. The remarks they had just listened to referred mainly to the three classes of funds with which they had to deal, and it had been urged that those funds should be separately stated in the accounts. Upon that point he would say that it was shown, under a distinct head, what the Trust Funds were, and the amount of interest received from each, but they did not show exactly the expenditure of the monies received from those trusts; but when they saw how few the items were under that head, he apprehended there was no difficulty in extracting from the accounts, as now placed before them, the way in which those funds were appropriated. In the first place, with respect to the Swiney bequest the amount was £4,500 stock, as stated; but in the former mode of arranging the accounts, which had been adopted on the recommendation of an eminent accountant in the City, £1,333 6s. 8d. was set apart as the amount which would exactly supply the interest to provide for the prize of £200, which was given every five years under the terms of the bequest. Why this should have been done, though it was done under very high authority, he (the Chairman) could not say, and he did not agree with it. The fund was charged with a certain specific sum every five years, and the remainder of the interest was applicable to the general purposes of the Society. With regard to John Stock's bequest of £100, they had had some difficulty in finding out the precise terms of it, as it dated back as far as the year 1782. The purpose of that bequest was found to be to provide a medal for the encouragement of drawing, sculpture, and architecture, and medals had been offered. This year one was offered as a premium to female artists for cameo cutting; but that offer had not been responded to. The same remark applied in a great measure to the Fothergill bequest, which was appropriated to matters connected with the preservation of life and property from fire; that prize had been offered but had not yet been awarded. With regard to the Cantor bequest, the Council had, they believed wisely, appropriated a portion to the courses of lectures which had been delivered, and which it was proposed to continue next year, and also in the expenditure of £50 in the purchase of books for the library. He thought it would be rather difficult for any one to find an exception to the manner in which these trust funds had been administered. With regard to the South Australian Institute, there was an old arrear of £40, which, being brought forward in the present accounts, made an apparent discrepancy to that amount. They were told the Society could not be congratulated on its financial position; but what were the facts? They had this year paid out of the legitimate funds of the Society £1,500 for repairs, and upwards of £1,000 for Jury Reports. It could not be denied that their property was improved to the extent of the £1500, and with respect to the jury reports, they were undertaken by the Council upon the Commissioners for the Exhibition declining the publication. It was thought of great importance that a proper record should be made of the Exhibition of 1862. The dimensions of that work had extended much beyond what was originally contemplated, but no one would deny that it was a most valuable volume, as well as a very cheap one to those who had been subscribers to it. Still there was the fact that the publication had been attended with that amount of pecuniary loss to the Society; but the Council were prepared to justify the course they had taken in having produced a work creditable to the Society and useful to the public. Thus, in the way he had stated, no less a sum than £2,500 for those exceptional matters had been paid out of the annual income, still leaving a balance of £229, all ordinary expenses being paid. Then they were told that the state of their property must be bad, because they valued the lease at only £3,000, whilst £1,50 had been paid in repairs, and there was a further liability of £900 under that head. It had not been the wish of the Council to overstate the value of the Society's property, or they might have put it down at a higher figure. Of course, if they were obliged to dispose of their property at once, it could only be done at a disadvantage; but anyone looking fairly at the Society's financial position could not but feel satisfied with it. He (the Chairman) did not hesitate to say that the Society was financially in a flourishing position, and, judging from the interest shown in its proceedings during the last year, it was more likely that that position would be improved than deteriorated. Then, with regard to Mr. Wright's observations upon the item of £150 for the conversazione, he could only look upon them as a joke. It had been said that as the cards of invitation were issued in the name of the Council, they ought to pay the expenses. In that view he begged to differ from Mr. Wright. He ventured to think it was a most legitimate and appropriate application of the funds, and he was quite sure those gatherings of the members were a source of great pleasure and gratification to them. The general feeling was in their favour, and, so long as they were supported, the Council would not hesitate to bring forward that item in the annual accounts. He repeated that the Council were indebted to Mr. Wright for calling attention to these matters. All they wished for was the strictest investigation.

Mr. J. H. Murchison said he could not agree with the conclusions of the chairman that the financial position of the Society was a flourishing one. The liabilities, for which funds must be found, amounted to no less than £4,318. What had they to meet that? The balance at the bankers was £299. The estimated subscriptions unpaid were £1,600; they had £1,771 Consols and £355 of India bonds. That was all they had to meet that liability unless they sold their lease and furniture. All the available assets, apart from that, including the estimate of subscriptions in arrear, left them with a deficiency of £681. He left members to judge for themselves whether that was a flourishing financial position. With reference to the conversazione, the chairman had referred to it as a small item of £150; but it would be found that during the last seven years the expenses of those entertainments had amounted in the aggregate to £1,500, or over £200 a year. In this respect he said this Society differed from many other important societies, in that these entertainments were given at the expense of the Society, instead of that of the president or the president and Council. He considered the Society ought not to be saddled with so large an expenditure for purposes which could not be considered legitimately within its objects, and it would be found that the sum expended in medals bore a small percentage upon that expended upon the conversazione. Another point he wished to bring before the meeting was the, to him, extremely objectionable mode adopted for obtaining new members to the Society. That was by means of a lithographed circular sent out in the most promiscuous manner. He had heard of instances in which the circular had been received by the same post, both by present members and the *employés* in their office. He thought such a mode of canvassing for new subscribers most improper and undignified in such a society as this. It had been said that the income of the Society was £8,000 a year. He (Mr. Murchison) could not understand on what principle that conclusion was arrived at, because he found the annual subscriptions amounted to only £5,700. He did not think the explanations of the chairman had satisfactorily disposed of the remarks which Mr. Wright had addressed to the meeting, and he hoped the manner in which the Council had endeavoured to obtain members by promiscuous circulars would be discontinued.

Mr. Philip Palmer remarked that a slight arithmetical calculation showed the expense of the conversazione to be one shilling a head for each of the 3,000 members of the society, and if it were known that such an entertainment as they received at South Kensington could be had for only a shilling each, it would rather tend to increase the number of members. With regard to the circular to which the last speaker had alluded, he presumed it was sent to the heads of firms and others, inviting them to become members of the Society, in doing which they alike benefited themselves, and did honour to the Society. He saw no objection to such a mode of canvassing, which was done more or less by every society of importance.

Professor Tennant thought Mr. Murchison was labouring under a mistake with regard to the annual income of the Society. He (Professor Tennant), from the figures before him, made the income £6,754.

Mr. Murchison expressed his dissent.

Mr. Symons expressed a hope, now that the library was remodelled and placed in so excellent a reading-room, the Council would take into consideration the propriety of opening it to members one or two evenings in the week. This, he said, would be a great boon to those who had fixed occupations during the day. The *Journal* had been very much improved, but its value could be enhanced by the restoration of the table of contents in each number. With regard to the conversazione, he only knew of one or two instances in which the expenses were paid by the presidents or councils of societies.

Mr. Newton Wilson presumed that the Society would be recouped a considerable portion of the expenses for the Jury Reports of the Exhibition of 1862 by the sale of the copies which remained to be issued. With regard to the general accounts he considered they showed the Society to be in a very satisfactory financial position; there were exceptional items of expenditure this year which would not occur again. He expressed his entire approval of the expenditure for the conversazione, and said he should not enjoy those entertainments so well unless he knew that he individually contributed a small modicum towards the expenses. He believed there was an almost unanimous feeling amongst the members in favour of the conversazione. With regard to the invitations to join the Society, he considered such a course necessary in the interests of the Society, and it was one which was very generally adopted by other societies. He had confidence in the officers of the Society that the invitations would only be addressed to persons who it would be desirable should become members.

Mr. Eamonson remarked upon the fact of the annually recurring criticisms of Mr. Murchison, for the purpose, as it seemed to him, of merely getting up a discussion. He had noticed this for some years past. With regard to the accounts, if the members did not approve of the auditors, they could elect other persons to that office; but they ought to have confidence in those who acted in that capacity. With regard to the conversazione, he thought no money was better spent, inasmuch as at a very small expense an entertainment was provided from which every one went away delighted, and he considered, in a social point of view, such assemblies did a great deal of good. With regard to the circulars of invitation to become members, he gave the Council and officers the highest credit for taking that course, because, in the present day, people were so absorbed in the matters of every-day life, that it was necessary to call their attention to the existence and objects of societies like this.

Mr. Harry Chester thought the criticisms to which the last speaker alluded were more irksome to the members at large than to the Council in particular, because nothing gave them more pleasure than to have their actions scrutinised; but if there were no greater defects observable than those which had been brought forward to-day, he ventured to think, as a member of the Council, their proceedings had been tolerably satisfactory. With regard to the form in which the accounts should be presented, not a word of objection was to be urged against the criticism into which the first speaker had entered; but in any other form the accounts would, no doubt, be open to an equal degree of criticism from some new quarter. He had certainly regarded the strictures that had been made upon the conversazione as a joke, but perhaps it was really regarded as a serious matter by some. He thought that such criticism as had been offered to day did the Council no harm whatever, but rather tended to excite more sympathy towards those who did their best to serve the Society, than if matters were passed over in silence. If a blot could be hit upon the Council would be only too delighted that it should be exposed. With regard to the sending out of circulars of invitation, he did not agree with Mr. Murchison. The Council, in the invitations thus sent out, did not ask anything for themselves. In all the Secretary did, as the organ of the Council, the sole motive was to promote the Encouragement of Arts, Manufactures, and Commerce, and they could safely leave the matter in the hands of their officers. The system complained of had brought them many excellent members of whom the Society had reason to be proud.

The Chairman said there were one or two points which he could not allow to pass without notice. With respect to the Society being singular in charging the conversazione to the general funds, and in sending the invitation cards in the name of the Council, he begged to say it was not the case, inasmuch as this course had been pursued, to his own knowledge, by the Horticultural, the Pharmaceutical, the Royal Botanic, and the Photographic Societies, as well as by King's College. The form of invitation in the name of the Council, was commonly adopted by all public companies and bodies—the Master and Wardens acting in the case of commercial companies, and the Lord Mayor on behalf of the corporation, &c. With regard to the opening of the library of an evening, he would promise the attention of the Council should be given to the subject. The table of contents in the *Journal*, which had been omitted in order to save space, since the alteration of the form of the first page, should be restored in the next volume. Upon the subject of the Jury Reports, he would say that the actual pecuniary loss, owing to the great extension of the work beyond the limits originally contemplated, would be about £1,000 as stated in the accounts. The Chairman then put the question, That the report be adopted, which was carried unanimously.

Mr. George Blackie called attention to the overcrowded state of the room at some of the evening meetings, and especially at the Cantor lectures, and suggested the propriety of only allowing members to admit one friend on each occasion, instead of two, as at present.

Mr. Newton Wilson proposed a vote of thanks to the chairman for the ability and urbanity with which on this and all public meetings of the Society he had presided over the proceedings; and the resolution, having been seconded by Mr. Chester (who remarked upon the arduous duties of the Chairman of Council), was carried by acclamation.

The Chairman, in acknowledging the vote of thanks, said he hoped he should never have a more difficult task than hearing with good humour such criticisms as they had heard to-day. As far as most of them were concerned, there was no difficulty whatever; and with regard to the one exception, all he would say was he had now become accustomed to it.

The ballot having remained open one hour, and the scrutineers having reported, the Chairman declared that the following members had been elected to fill the several offices. The names in *italics* are those of members who have not during the past year filled the offices to which they have been elected:—

COUNCIL.

PRESIDENT.

H.R.H. the Prince of Wales, K.G.

VICE-PRESIDENTS.

Edward Akroyd.
Sir Wm. G. Armstrong.
Lord Berners.
W.H.Bodkin (Assist.Judge)
The Earl of Caithness.
Harry Chester.
Henry Cole, C.B.
John Dillon.
The Earl Granville, K.G., F.R.S.
William Hawes.
Lord Henry Lennox, M.P.
Lord Lyttelton.
M. H. Marsh, M.P.
Right Hon. Sir John S. Pakington, Bart., M.P.
Sir Joseph Paxton, M.P.
Sir Thomas Phillips, F.G.S.
The Marquis of Salisbury, K.G.
The Duke of Sutherland.
Thomas Twining.
Vice-Chancellor Sir William Page Wood, F.R.S.

OTHER MEMBERS OF THE COUNCIL.

Professor Bentley.
Hon. and Rev. Samuel Best.
D. Roberton Blaine.
Peter Graham.
Samuel Gregson, M.P.
Edward Hamilton.
Chandos Wren Hoskyns.
Samuel Redgrave.
Sir Francis Sandford.
Henry Vaughan.
Geo. F. Wilson, F.R.S.
Thomas Winkworth.

TREASURERS.

W. B. Simpson. | *G. Dixon Longstaff, M.D.*

AUDITORS.

H. Reader Lack. | *Seymour Teulon.*

SECRETARY.

Peter Le Neve Foster, M.A.

FINANCIAL OFFICER.

Samuel Thomas Davenport.

A vote of thanks to the Scrutineers was then passed.

At this meeting, in conformity with the provisions of the Act 3 Will. IV., cap. 4, intituled "An Act for Settling and Preserving Sir John Soane's Museum, Library, and Works of Art in Lincoln's-inn-Fields, in the County of Middlesex, for the benefit of the public, and for establishing a sufficient endowment for the due maintenance of the same," a new trustee of the Soane Museum on the part of the Society of Arts was elected, Mr. Samuel Redgrave having been unanimously chosen in the place of Sir C. Wentworth Dilke, Bart., whose term of office under the Act had expired.

At the conclusion of the General Meeting a Special Meeting was held, when the following candidates were balloted for and duly elected members of the Society :—

Annan, David, 33, High-street, Bow.
Barnett, Henry, 15, Halkin-street West, W.
Boutcher, Emanuel, 12, Oxford-square, W.
Briggs, George Walker, 45, Wigmore-street, W.
Callender, William Romaine, F.S.A., Victoria-park, Manchester.
Campbell, Rev. William, Privy Council Office, S.W.
Clarke, Ebenezer, jun., 78, Cannon-street West, E.C., and Walthamstow, Essex.
Dobson, Thomas J., Hull.
Dowling, Charles Hutton, 28, Neville-terrace, Hornsey-road, N.
Frere, P., Regent-street, Cambridge.
Hicks, William Robert, Bodmin, Cornwall.
Hill, Sir Rowland, K.C.B., Hampstead, N.W.
Hoare, John Hatch, Barkley, Leicestershire.
Howell, Thomas, War Office, Pall-mall, S.W.
Johnston, William, 32, Buckingham-terrace, Glasgow.
Jones, James Valentine, 21, Cambridge-road, Islington, N.
Kibble, Thomas, L. 3, Albany, Piccadilly, W.
Locke, John, 83, Addison-road, Kensington, W.
Leigh-Sotheby, Mrs. S., Rozel, Lower Norwood, S.
Owen, Rev. Joseph Butterworth, M.A., 40, Cadogan-place, Chelsea, S.W.
Rabino, Joseph, 1, Dunster-court, Mincing-lane, E.C.
Rake, Alfred Stansfield, C.E., Passage West, near Cork.
Richards, Josiah, Abersychan Literary Institution, near Pontypool.
Robinson. Rev. Isaac Banks, Milford, Sudbury.
Robinson, William, Lloyd's, E.C.
Selwyn, Capt. Jasper, R.N., Chequers-court, Tring.
Shoolbred, James N., 84, Middle Abbey-street, Dublin; and 21, Parliament-street, S.W.
Stewart, Alexander J. R., 13, Belgrave-square, S.W.
Waterlow, Alderman Sydney H., Carpenters'-hall, 68, London-wall, E.C.
Wilson, John Guy, 109, Market-street, Manchester.
Wyland, Edward, 54, Piccadilly, W.

EXHIBITION OF STAINED GLASS.

The following is from a correspondent :—

The opening of a new court or gallery at the South Kensington Museum has been marked in the history of recent art by the fact that its windows have been utilized for the display of a collection of works of art in glass-staining, an art which, more than any other, has made rapid strides in this country of late, and is now employing hundreds of hands, whereas, not many years ago, it was said, by a writer more or less qualified to give an opinion, that the whole practice of glass painting was extinct in this country, and on the continent only existent in Holland. This was literally true; but a greater truth remained unstated. This was, that although the practice of manufacturing painted glass and putting it into windows had not ceased amongst us, any more than it had on the continent, no person worthy of the name of an artist had given his attention to the practice in question; and painters, Sir J. Reynolds, for example, had been employed to produce designs for decorations of this kind, and had done so in a manner which proved their utter ignorance of the art they ventured to practice, as well as their blindness to its peculiar conditions of existence. Thanks to the exertions of critics, the manufacturers, and, what is of most importance, the public, are rapidly getting filled with a proper understanding of this matter; and although pictorial windows continue to be produced by the former, who have not the excuse proper to the latter, that they have not leisure to study the question, it is obvious, not only in the new gallery at South Kensington, but throughout the country, that pictorial windows are getting scarcer, while hypocrisy, that homage which error is said to pay to truth, is incessantly practised by persons who, unable to design under conditions they have not been trained to understand, condescend, nevertheless, to imitate the superficial appearance of decorative glass-painting in the manner of using the leads which hold the fragments together, although they are not able to depart from the transparency system so beloved by the *dilettanti* of the last century, and still affected by those upon whom the reflection of their light falls. That light is fading fast before the art-education and the progress of the people.

Among the quackeries of dilettantism—that eldest born of conceit and ignorance—is the love for pictorial glass, *i.e.*, the transparencies of a recent and even the present date. All who understand the question, and are desirous that one of the noblest of the decorative arts shall not be made

a foolish toy, must rejoice to see the large number of legitimately designed works the collection at South Kensington comprises.

All classes of workmanship are more or less completely represented in the exhibition now under consideration. Some examples, which it will be needless to particularize, do not comply with the conditions of art, which require that good drawing and good colouring should be employed to express thought and meaning; some possess good drawing without good colour, and others are fortunate in the reverse way. It is matter for congratulation that the conditions of the art are getting understood, and that so many persons recognize the absurdity of depicting objects, which are seen in nature by reflected light, in such a manner that transmitted light alone can display them to the spectator. It ought to be clear to every one that as a window forms an essential and characteristic part of a building, it should be subjected to the laws of architectonic art, and treated according to its position as an element of architecture. Architecture will not admit of imitative art, and its subordinate elements follow the same rule. A man should not build a house to look like a tree, although it might be possible to live in such a one; so that the fact of its being practicable to inhabit a house which resembles something which it is not, has not more to do with the subject than the practicability of producing a sufficiently close resemblance to a man in stained glass by means of imitative art has to do with the propriety of so employing it. To imitate is not, as it will be endeavoured to be shown a little further on, the noble end of art; in fact, it is one of its lowest aims. To enter the ranks of imitation with such an antagonist as painting *per se*—which renders atmospheric effects with almost perfect fidelity, and deals with expression with facilities unknown to other development—is surely no wise nor dignified course on the part of the professors of such an art as that of glass-staining. It is best that every art should be reserved in all its strength for the display of its own peculiar qualities, qualities whereof it is undoubted master, and under circumstances of its own choosing. To fill the windows of a building with beauty and splendid colours is the peculiar office of stained glass. It is better that it should be content with this privilege, than in the attempt to rival pictorial art in its own province of imitation, it should part with qualities proper to it, and violate the laws of art by the act.

If it is right that imitative art should not appear in architecture or its subordinates, how much more so is it that Nature herself should not be violated, so to say, by the production of false effects—effects, moreover, which by their own power add no force of expression to a picture, and, because they are imitative, render no thought more impressive? It is a false effect to paint a man as if he were transparent and had light shining through him—this is what is constantly done in what is styled pictorial or imitative glass staining. It is a false effect to represent, by means of grades of comparative transparency and opacity, those appearances of light and shade and colour which nature has chosen to produce by a means which is directly the reverse of that practice—such is the practice of pictorial glass painters. These errors are not necessities of the existence of such art as is now under examination.

Were anything to be gained by thus far transgressing the laws of art and the customs of nature, something might be urged in defence of the practice of producing imitative stained glass. Such is not the case, however. It is a low kind of pleasure that is afforded at any time by faithful imitation of natural objects in art, and when Nature herself is favourable—as in painting proper—to the result. But to produce imitations of objects contrary to her customs is nothing less than an absurdity. The noble aims of art are expressiveness and suggestive power; these do not depend upon imitation, and are not unfrequently incompatible with it, as the arts of architecture and music have, in all ages, attested.

As, however, nothing is gained by the practice but the chance of applause from thoughtless persons, it is difficult to conceive why what are styled transparencies in glass have been endured so long. The sole explanation that can here be offered is that no artist of real power has devoted himself to the art of glass painting since the mediæval practice went out of use, together with the glorious architecture which it adorned, and of which its productions once formed component parts. Possibly the idea that stained glass was confined to ecclesiastical uses long held possession of the public mind, and when that idea became weak, it was felt that a style, which should be as far as possible removed in character from that of the middle ages, would be best suited to secular uses. That there exists any indissoluble connexion between the Gothic style of architecture and the art of glass painting in this respect, need not here be denied. Decorative, as distinct from pictorial or imitative, art, has ample power for all kinds of employment, and it is but the limited knowledge of its practitioners which would restrict its exercise.

In saying that nothing was gained by transgressing the laws of art in this matter, it was intended to express the fact that all the effect that Art can produce in such situations as those appropriate to stained glass windows, which are intended to be seen at a great distance from the eye, may be as well treated upon decorative as upon pictorial or imitative principles. Forty feet distant, and with the light shining through it, the delicate drawing and modelling of a painted face are thrown away. Such a countenance resolves itself into a generalized, although it may be potently suggestive representation, and it is to little purpose that the artist seeks to rival the elaborations of a miniature. Imitation must, from this mere physical necessity of employment, be limited, and it cannot be completely efficacious even so far as the distance of the spectator would admit, because, were he nearer, the intensity of the light required to bring out the glories of coloured glass would effectually prevent him from regarding a face except singly. As faces are but parts of figures, the intention of painting would thus, by this simple cause, be defeated, because a coloured window ceases to be a picture in any proper sense, if it can only be seen piecemeal.

To be viewed piecemeal, is not the end of painting on glass; but rather that it should be displayed at a distance from the eye, and thence strike the spectator by the grand display of colour, one of the uses of which is to fill the whole of an interior with gorgeously-hued light, adding to its solemnity or its beauty. At such a distance the figures of saints and warriors, men or angels, become glorified and draw inspiration, not because they truly resemble humanity, but because they do not so resemble, and rather suggest something of their own. If imitation were the end of art, as the advocates for pictorial glass would, by their limiting ideas of the latter, seem to infer, then most of the finest pictures and statues—which aim at the expression of thoughts rather than things, would be comparatively worthless. If expression be denied to be a prerogative of decorative art, then nothing but that which is not an absolutely faithful in imitation of nature will be endowed with that quality or with power over the mind. Sculpture, which cannot carry imitation to any extent, would perish on that account. Music is, in its noblest manifestations, the least imitative of arts, and yet of all of them it is the most expressive, the most pathetic and suggestive. There is a quality in colour which is akin to that of melody in music—this is perceived by some more powerfully than others. This quality appears at its highest in the effects of stained glass, a result we should anticipate, from the fact that light—the displayer and father, so to say, of colour—is the immediate agent of display for the productions of that art; in short, stained glass, as an art, has rights and qualities proper to itself. Let us now see which, amongst the works before us, best comply with these

conditions, or are best worthy of admiration on account of the genius of their designers. In selecting these for special comment, it is by no means intended to assert that others do not exist here which are worthy of praise. They are rather such as best illustrate the principles of the art above referred to.

This class is represented by contributions which declare that glass-staining has occupied the genius of men who are artists in the right sense of the word. Such a discovery—it will be a discovery to most men, and most of all to those who are capable of appreciating art in any of its manifestations, but who are not aware of the progress of that branch now in question—is of the highest importance, and promises a result which cannot be appreciated too highly. Public intelligence in matters of art is advancing so rapidly in the right direction that the demand for good examples would be certain to create supply; it is satisfactory, therefore, to observe that the tradesman-like idea of decoration, which has so long exercised itself in glass-staining, has been superseded by one which is truly artistic.

As usual there are grades in this advance; some manifestations are not so valuable as others. In Messrs. O'Connor's great window, representing the "Life of Christ" (1), a series of subjects, there is much to be admired and much to be warmly commended. It is rather due to a lack of subtle knowledge of colour than to ignorance of the peculiar conditions of the art, that this firm has not succeeded in producing a wholly complete and satisfactory example. Had the arrangement of colour in No. 1 been considered as a whole, and the window regarded as complete, it is hardly conceivable that this error would have presented itself. The window is, in most respects, a fine one, and lacks only repose of effect—effect depending in glass-staining, let it not be forgotten, entirely on colouring, or proper management of colours, so that it shall come in the place of *chiaro-scuro*, and light and shade in an ordinary picture. A stained-glass window exists only by colour and, consequently, on successful dealing with colour all its value depends. Messrs. Powell, in No. 4, a series of subjects from the "Life of the Virgin," show much purity and elevation in their designs, much feeling in their expressions, and, to a certain extent, admirable breadth of treatment. That breadth and the brilliancy which are attendant on a high note of colouring have, however, been attained by these artists, who are indebted, it is said, to Mr. Holiday for their figure-designs, by a sacrifice of repose and general avoidance of purely negative tints.

Some admirable examples, upon which, above all, felicitations as to the progress of the art are based, are contributed by Messrs. Morris, Marshall, and Faulkener, who send about twenty works, having both sacred and profane subjects, comprising decorations proper to ecclesiastical as well as domestic uses. It is observable that few other exhibitors of worthy works seem to have given attention to the latter class of examples. Let observations on the former come first. Here is a fragment of a "Jesse" window, or genealogy of Christ, which deserves admiration, not only on account of the broad and vigorous manner of its design, but for the beautiful nature of its colouring and apt disposition of masses to the end in view. It is not often that such subtly-graded varieties of hues appear in glass-staining as those in the green garments of Isaac, of Ruth, and of Jacob. A figure of St. Cyprian, comprised, like the last, in the series massed under the No. 3, deserves warm applause for the propriety of its decorative character, as well as the brilliant softness of the golden yellow of the chasuble the saint wears, and its gorgeously-hued carbuncle-coloured lining. Meagre reds, cold blues, and crude greens appear not at all in Messrs. Morris, Marshall, and Faulkener's works. In "Adam delving" (3), there is a sober tawny-red, of crimson quality, which is delightful.

The figure of David Dancing to the Harp (3) is not less admirable for design than for colouring. See an example of the wise use of green in the dress he wears. It is especially worthy of note that nowhere in their contributions does this firm of artists appear to indulge in eccentricities, or aim at the revival of old styles. Drawing, with them, is not affected nor grotesque; they do not draw ill because the ancients did so, nor is affectation of expression their forte. In the examples of domestic glass, (16) which are not less worthy of attention than those purposed for ecclesiastical uses, this firm is quite as fortunate as in the latter. The series illustrating the "Legend of Good Women," of Chaucer, is a production of high art; nothing can be truer to the theme both in representation and apt poetic design, than these exquisite compositions. The figures of "Love," leading Queen Alcestis by the hand, of Alcestis herself, and those which represent Queens Cleopatra and Dido, are as various in feeling and in treatment as Chaucer himself meant them to be. The use of yellow stain over pale blue in the dress of Alcestis and the gold crown she wears, are charming phases of colouring, apt to the subject, and commendable to rival manufacturers as well as to artists. The beautiful green-olive hue of Chaucer's dress where he lies sleeping in the arbour, subject of the first work of this series, should be considered in relation with the warm, pure silver tint of the grisaille back-ground and the glowing splendours of the red head-dress he has. Two beautiful heads, drawn with grisaille, and inclosed by splendidly-hued but perfectly harmonious borders, representing Penelope and St. Cecilia, are pleasant examples of modern art, suitable to modern habitations. In this respect the warm and silvery-hued character of the grisaille employed by this firm makes it doubly welcome. The theme of "How St. George was married to the Lady Saba, and the head of the Dragon brought to table on a capacious dish," has humour in it. Sir Tristram performing on the harp to the shepherds, placed above the last, deserves attention. It is not too much to say that modern stained glass has never shown itself so happily employed as in these examples. Fine design and beautiful colour have been united, and made aptly expressive of poetic thought. In the "Legend of Good Women" series, good drawing appears throughout—see that of the flowers in the arbour Chaucer sleeps in, and that of the figures in general, whether they appear in the domestic or the church glass. The broad distinction in the functions of these applications of the art have not escaped the attention of Messrs. Morris, Marshall, and Faulkener. In the latter, colour, potency of tone and aptitude of expression have occupied them; in the former, the abundant use of sweetly-hued grisaille would silver warmly and temper—but not obstruct, the pas-age of light to the interior of a room intended for constant occupation.

MINING IN VICTORIA.

By Mr. Philip A. Eagle.

[*Continued from page* 540.]

CHAPTER V.

Silver.

It is not improbable that silver will shortly be added to the list of products exported from Victoria.

Rich argentiferous ore has been found at St. Arnaud's, Glendhu and Crowlands, in the Wimmera district, and it is believed, by many whose opinions command attention on such a subject, that silver bearing lodes exist in several other districts throughout the territory.

The silver reef at St. Arnaud (New Bendigo) is at the present time attracting the greatest share of attention. The lode in the company's claim on this reef is several feet thick, largely impregnated with the various forms of argentiferous ore which exist in the extraordinary veinstones running through it. The ore is found in combination with gold in large quantities, and occurs principally

in the form of a chloro-bromide. In some places the reef presents the appearance of having been exposed to fire, and in others as if a stream of water had been percolated through the quartz, and so loosened it that the gold runs out from the matrix. In other places again, the stone is found very hard, though as abundant in gold as the softer portions. The reef was found on the surface, and the deepest shaft in a neighbouring claim is 70 feet only. The workings, however, have revealed two other reefs, one on each side, both yielding silver. From the surface stone, silver as well as gold has been obtained, and as the reef deepens and increases in breadth, the silver increases in proportion. The principal workings are only 30 feet deep, and the mullock as well as the quartz is taken out, the reef at this depth being some 13 or 14 feet in width. The quartz is much much mixed with sandstone and slate, and that which is richest in silver is in a honey-combed state. The casing is a blue slate. Similar appearances, it is believed, are observed in the silver mines of Mexico, and experience as to those mines leads to the conclusion that when the reef is followed down to a considerable depth the silver will be obtained in a metallic form.

The average yield of combined gold and silver was at first from 7 to 8 ounces to the ton; but at a subsequent period as much as 1,104 ounces of amalgam was obtained from 37 tons of stone, and recently ore has been raised which has yielded 1,000 *ounces of silver to the ton!*

But as the process hitherto adopted for its extraction has been applied principally with a view to obtaining the gold, a considerable portion of both gold and silver is lost in the absence of proper means to secure it—if, indeed, a practical method has as yet been invented to meet the singular form in which the ore is found. The quartz is taken from the mine to the kiln, and there burnt. It is then put through the crushing mill in the usual manner. The product of the amalgam in the retort is a bar of mixed gold and silver, worth about £2 per ounce, which is sent to town, where the one metal is separated from the other, the gold (the fineness of which is 23·3$\frac{5}{8}$) fetching the usual price, and the silver being sold for 5s. 6d. per ounce. The usual proportion of metal in the bar is one-third gold and two-thirds silver. So great is the waste, however, that a sample of the tailings from the mill gave ten ounces of silver and five ounces of gold to the ton.

From the amalgam two powders are got, one before and the other after retorting. The first of these is very fine, of a pale-brown colour, and light in weight, but the rudest experiment is sufficient to show that it contains at least twenty-five per cent. of silver. The material obtained from the retort is of a darker colour, somewhat resembling lead. It is much heavier, and probably contains gold and lead as well as silver, but neither of these powders has as yet been properly analysed. They are simply waste products, which are thrown away. In the well-calcined stone the chloride is partially converted into round globules of silver, and it is these alone that are caught with the gold in the amalgam and saved. A wide departure from the old mode of manipulation is necessary to enable the whole value of the lode to be realised.

Bismuth has also been lately discovered at St. Arnaud, estimated to be worth £2,000 per ton.

Antimony.

The MacIvor antimony mines, situated about nine miles from Heathcoate, are a happy illustration of "what may happen to a man in Victoria," where the resources are so extensive and so little developed. It had been known for years past that an antimony reef existed on the station of Moorabie, at one time the property of Mr. J. H. Patterson. It was opened by a man named Doyle, and eight years ago specimens were sent to a mercantile firm of high standing in Melbourne. No gold, however, was seen in the antimony; and as even the latest authorities do not mention that gold has ever before been discovered in combination with antimony, it is probable that no analyses of the specimens were made. At all events, the market for antimony was known to be limited, and the reef was abandoned, as a speculation that could not be worked with profit. A shepherd on the station, however, afterwards discovered, at some distance from the old workings, a reef of antimony in which gold could be seen, and he offered to point out the spot for a £10 note. The offer was accepted, and the reef now worked by Coster's party was shown to them. They opened the ground, found a reef, within a foot of the surface, four feet broad, and within a few weeks afterwards they had proved the auriferous nature of the antimony. Their next effort was to obtain machinery to reduce the ore, as quartz is crushed, for the sake of the gold in it. The purest antimony, or that in which no gold or quartz was seen, was picked out, and a market was found for it in Melbourne at £5 10s. per ton, on the ground. The quantity thus raised and sold enabled the party to purchase and erect a small high-pressure steam-engine, and a battery of six head of revolving stamps; and thus, at a total expenditure of £4,000 or £5,000, mostly drawn from the mine itself, the owners now find themselves in possession of a large extent of reef, a complete though small crushing plant, and a material so rich in gold, or, if poor in the precious metal, metal so excellent for export, that they have a splendid prospect before them. The mine so far as it has been yet opened up, promises a yield of antimony that may be said to be unlimited. It has been traced from north to south for about three miles and a half, and has been found to vary in width from nine inches to eight feet, the ore increasing in richness in gold as the reef narrows, a peculiarity generally found in the quartz reefs, running north and south—almost true astronomical north—though, curiously enough, the quartz reefs now worked in the same district have not observed the law with the same fidelity, as they lie considerably to west, with spurs running east and west. At the first level, put in at a depth of fifty-five feet, the reef is found of the same breadth; and at the water-level, ninety feet, scarcely any increase is observed. The reef is nearly perpendicular, with a slight underlie to the east. The casing is sandstone, with a seam of greasy clay on the east. On the western side the reef is mixed to some extent with quartz, and here the gold is found most to abound. On the eastern face the antimony is purer, but a sample of the quality, in which no gold could be seen with the unassisted eye, and passed once through a common crushing-mill, has given as much as eighteen pennyweights to the ton. So far as the mine has yet been worked the reef has been found to increase in richness as it is followed downwards. A well-defined lode of copper ore has also been opened at this place, and is being actively worked. Antimony has also been obtained at Templestowe, Upper Yarra, Marybro', and other localities.

Fine Arts.

Fine Arts in France.—The annual exhibition of works of art held in Paris closed its doors on the 15th instant, with considerable *eclat*, and the rooms are now almost emptied of their late contents. The lottery, which obtained for some years, was not adopted this year, and no true lover of art regretted the change; but the Emperor and the government have purchased largely, the amount expended from the civil list and the department of the fine arts for pictures and sculpture amounting to half a million of francs, or £20,000. With few exceptions, the purchases consist of landscapes and works of *genre*. In addition to these the Empress, the Prince Napoleon, and the Princess Matilde—herself an exhibiting artist of no mean power—have purchased largely. The little Prince was also inaugurated in the school of connoisseurs, and selected a picture of a drummer earnestly employed in his vocation. The Melun exhibition was to

have been closed on the 15th, but remains open to the end of the month; the catalogue contains more than five hundred numbers, but some of these represent the works of bye-gone artists. As a provincial exhibition, that of Melun has been a success. The miniature portrait of Charles VIII. of France, generally supposed to have been painted by Raphael when only sixteen years of age, was sold in Paris a few days since, and attracted a large attendance, in spite of the fact of the artistic season being almost at an end. The work in question is scarcely larger than a man's hand, and Baron Rothschild carried it off from rival claimants at the relatively large sum of £108.

Manufactures.

Brush-Making Fibres.—There is a gread demand just now among brushmakers for some strong supple fibre which may supplement the present supply of piassaba or *bass* received from Brazil. Two strong fibres, the produce of different palms, have been for some time received from the two ports of Para and Bahia. Of late less care has been given to the selection and preparation of these fibres in South America, and they are much mixed with waste and useless fibre. The piassaba fibre, and the so-called Mexican grass, the produce of the leaves of Agate, have quite revolutionised the brush trade by cheapening the cost and replacing bristles. Owing to the improvements in Russia, arising from attention to bacon and ham curing, bristles are less stout and plentiful than they used to be from the wild hogs. The attention of residents in tropical regions may therefore be drawn with advantage to the demand for new fibres for brush-making, street-sweeping machines, and chimney-cleaning brushes. The midribs of the leaves of many of the palms, a stronger and stouter substance than the kittool and ejoo fibres of Ceylon and the East, are what is wanted, and probably some wiry grasses like the esparto might be experimentalised upon with advantage. They would realize a good price if suitable and to be obtained with regularity and in quantity.

Commerce.

The Scotch Pig Iron Trade.—The total declared value of the exports for the four months ending 30th April, was £49,892,420, thus exhibiting an increase of £10,434,049 over the corresponding period of last year. The excess of this year over last is equal to thirty millions sterling for the 12 months, and unless commercial enterprise be interrupted by political events, there is no reason to fear that the result will in any way fall short of this marvellous amount. It will be observed the iron interests maintain their position in due proportion in these statistical results, the increase of iron, exclusive of machinery and hardware, being £536,000, which is more than half of the value of the stock of pig iron at the price of to-day in the storekeepers' stores in Scotland, viz., 330,000 tons. The shipments of pig iron from Scotland are already this year 245,066 tons against 218,382 in the same period of 1863, thus showing an increase of 26,684 tons. The home consumption likewise progresses; the total deliveries continue in marked excess of the production, and it is freely admitted that a considerable inroad has been made on the stock, which is now scarcely equal to 7½ months' consumption. Though the demand, the price, and the prospects, warrant an increase in the production, yet so scarce and dear is the raw material in the iron-making districts of Scotland, that even were the price to advance 10s. or 15s. per ton higher, as in the years 1854, '55, '56, and '57, we question if over two or three additional furnaces could be put in blast and kept in operation. Meanwhile it is not to be wondered at, that with the Dano-German war, and a severe tightness in the money market, the price should have lately fallen from 70s. to 60s. per ton.

The Tin Plate Trade.—The announcement that the import tariff is to be increased 50 per cent. in the Federal States has given a decided check to the demand for tin plates on American account, and during the continuance of this high protective duty the shipments to that country will, it is expected, be greatly reduced. The value of the tin plates exported now exceeds one million sterling. and of this quantity North America has hitherto taken more than half—last year £671,418. Although an important market for tin plates is thus materially restricted, the makers seem to have confidence in the future, for several new works are in progress.

Opening of the Godavery River.—A parliamentary paper has just been issued, containing a report by R. Turtle, Esq. (officiating chief commissioner of the central provinces of India), on the river Godavery, and the advantages which would result from its being opened throughout for the purposes of navigation. The river has its source in the Suckhein mountains, about seventy miles north-east of Bombay. After crossing Dowlatabad and Golconda from west to east it turns to the south-east, and, receiving the river Bain about ninety miles above the sea, forms into two principal channels at Rajamundry, and these subdivided again form altogether several tide harbours at its different mouths in the Bay of Bengal. Its course is estimated to be about 900 miles long, but only 236 are navigable, and these only during a portion of the year. The obstruction to navigation consists of various rocks, natural barriers and shoals, but these are now in course of removal, and the advantages expected to follow are both great and manifold. The river route will then compete successfully with the railway for the carriage of the weightier articles of merchandise to Bombay for shipment, and the importance of this traffic may be inferred from the fact that the territory through which the river runs produces vast quantities of cotton, teak, oilseed, hemp, sugar, wheat, dyes, clarified butter, hides, wool, and iron. Opening up the river will save the state considerable sums in the conveyance of military stores. It will also enable the natives to import various articles at reduced rates, and this will be a great boon, especially in the important article of salt. The total cost of the contemplated works is about £600,000, but a lesser project is being first proceeded with.

Guano.—There has been rather a marked decline in the exports of guano this year. Thus the total receipts in the first four months of 1864, were 30,057 tons against 59,204 tons in the corresponding period of 1863. The receipts from Peru were 27,908 tons against 48,709 tons in the corresponding period last year. It remains to be seen whether the Spanish forcible possession of the Chinchas islands will interfere with the future supplies of the year.

Sherry.—Messrs. Matthew Clark and Sons, in their circular, say:—"There is no doubt the real actual consumption of Sherry has not only greatly increased, but is daily increasing, and although the zeal of importers to secure large stocks, combined with the desire of shippers to secure the advanced rates offered, has caused operations to be undertaken beyond present requirements; still the actual quantity of old wine has not increased—it has simply been transferred from one place to another. The result of these anticipatory operations has been to cause a glut of stock in England, which has been naturally followed by a somewhat depreciated realizable value; but if the concurrent testimony of all the Cadiz shippers is to have due weight, we cannot but conclude that as consumption gradually absorbs our excess of stock, towards autumn, when probably our dealers will again have to become buyers, prices for really fine old sherry must advance."

Obituary.

FREDERIC LAWRENCE, fourth son of the late Alderman W. Lawrence, and brother of the present Lord Mayor, was born in London, the 4th of April, 1828, and was educated at the City of London School, which he entered on the day of its opening, February 2nd, 1837. After passing through the junior school, and obtaining many prizes, he took a high position in the senior class, standing on one occasion second for a Scholarship, and on another occasion second for the Senior Mathematical Medal and Prize. He afterwards entered University College, London, where he obtained the first prizes for Geology, for Civil Engineering, and for Architecture as a Science, besides certificates for Chemistry and other branches of knowledge. In the year 1845 he was articled to Messrs. Walker and Burges, under whose direction he assisted in carrying out many important works, amongst which may be mentioned the harbours of Alderney, Dover, and Harwich, and the drainage of the middle level. Whilst at the middle level he directed his attention to the improvement of the sluices, and was allowed to fix, by way of experiment, a small sluice on a novel principle, which was found to act so efficiently that he patented the invention. The large sluices at the Commercial Docks are constructed on this principle; and for this invention he obtained honourable mention at the Great Exhibition of 1862. The invention consists in using the head of water as the motive power for raising and lowering the sluices. He also invented, in conjunction with his brother and Mr. H. Davison, a modification of the rotary engine, which consists in making the cylinder a true epicycloidal curve. In 1852 he entered into partnership with his brother, Mr. Alfred Lawrence, and established the firm of Lawrence Brothers, engineers and iron founders, City Iron Works, where he was enabled to turn to practical account his mathematical and engineering knowledge. He became an Associate of the Institution of Civil Engineers, by many of the members of which he was well known and much esteemed. Some years previously he had joined the Society of Arts, in the proceedings of which he took a deep interest. In 1863 he was elected a member of the Council, at the meetings of which he was a constant attendant, and his practical knowledge and intelligence secured him the high esteem of his colleagues. Mr. Lawrence died, after a few days' illness, at the Mansion House, on 31st May, aged 36, deeply lamented by his numerous friends, who valued him for his great talents, for his persevering energy, but above all, for his high integrity and upright character.

The Nova Scotia papers announce the death of Dr. ABRAHAM GESNER, F.G.S., well known as the author of "The Industrial Resources of Nova Scotia," "Remarks on the Geology and Mineralogy of Nova Scotia," "New Brunswick, with Notes for Emigrants," and as the collector of the greater portion of the museum of natural history in the Mechanics' Institute, St. John, New Brunswick. For many years Dr. Gesner has been engaged in literary and scientific pursuits both in the British American Provinces and in the United States, and just previous to his death he had completed for publication a work on the "Fish and Fisheries of Nova Scotia," which contains much valuable information.

Notes.

FRENCH ASSOCIATION FOR THE ADVANCEMENT OF ASTRONOMICAL AND METEOROLOGICAL SCIENCE.—This new society, of which a notice has already appeared in the *Journal*, is now completely organised, and in active operation. The following are the names of the directors:—Messieurs Le Verrier, Michel Chevalier, le Docteur Conneau, Glais-Bizoin, Payen, Vicomte de Vougy, Belgrand, E. Mouchez, Serret, d'Abbadie, Baron, Barral, Marié, Davy, Renou, A. Sanson, Gaillot, et Wolf. The first general meeting of the association took place a short time since, when the chair was occupied by M. Le Verrier, the director of the Imperial Observatory, who was supported by Dr. Conneau and M. Glais-Bizon as vice-presidents. Just as business was about to commence, a telegraphic message was received from the Imperial Observatory at St. Petersburg, congratulating the new association on its formation and first meeting. M. Le Verrier addressed the associated members on the present desiderata in astronomical science, the proposed establishment of observatories in the principal towns in the south of France, the services rendered to navigation by meteorological telegraphy, and those which it may render to agriculture. M. Renou, the secretary of the Meteorological Society of France, presented a report on the prizes to be offered in meteorology, which are as follows:—A grand prize of the value of 4,000 francs, for the best general memoir, printed or written, and whether in French or any other language, on the general movements of the atmosphere, with the view to the foretelling of tempests; the memoirs to be sent to the secretary of the association at the Imperial Observatory, Paris, before the 31st December, 1865; three prizes of 500 francs each, and five of 300 francs each, for observations made in places little known in that respect, or taken at sea; these to be sent in to the association before the close of the present year. Models and portions of the great telescope, now being constructed for the association by M. Léon Foucault, were exhibited, together with the fine blocks of glass destined to be employed in the formation of the great lens.

RAILWAY EXPENDITURE.—The *Revue des Deux Mondes* contains an article by M. Jules Gaudry on railway travelling, and in a note the author gives the following annual expenditure for material of one of the great lines in France, not specified:—30,000 mètres of cloth, for carriages and clothing of servants; the same quantity of cotton or linen cloth; 110,000lb of varnish, and the same quantity of turpentine; 88,000lb of linseed oil; 433 tons of oil for lighting; 96,000 brooms and brushes; 141,000 lamp glasses; 23,000 files and 77,000 tool handles; 14 tons of small nails; 474,500 pins; and 194,000 washers. Stationery about 700,000 francs (£28,000), including 4,000 stamps. The printing of the tickets alone, which are of two hundred different kinds, occupies seven machines. In addition, we are told that an express train weighs, on an average, from 80 to 100 tons, and that a goods train weighs about 600 tons, and is generally about 350 mètres long. The ordinary trucks when loaded weigh about 15 tons each, and the locomotives from 30 to 50 tons. The speed of the slowest goods trains is set down at eight mètres a second, and that of the express trains at 25 mètres per second. On the *Chemin de Fer de l'Est* the consumption of coal is given at 22lb per kilomètre, or about 700 tons per day—this quantity representing 70 waggon loads—and, with the consumption for the hydraulic service, the stations, and the offices, at 1,000 tons a-day. The consumption of water is calculated at eight times by weight of the coal burned, or 5,000 cubic mètres a-day, and double that quantity is set down for washing the carriages and other miscellaneous purposes. The same railway is said to employ not less than 14,000 persons.

MEETINGS FOR THE ENSUING WEEK.

MON. ...Entomological, 7.
TUES. ...Asiatic, 3.
Ethnological, 8. 1. Professor Huxley, "On certain Japanese and African Cannibal Skulls." 2. Mr. Vambery, "On the Kirghis and other Tribes of Central Asia."
SAT.......R. Botanic, $3\frac{3}{4}$.

PARLIAMENTARY REPORTS.

Delivered on May 21, and 23, 1864.

Par.
Numb.

Delivered on 3rd June, 1864.

200. Weather Forecasts—Papers, &c.
268. Weights, Measures, and Coins—Report of International Statistical Congress.
128. Bills—Charitable Trusts Fees.
129. „ Metropolitan Traffic.

Delivered on 4th and 6th June, 1864.

149. Electors—Return.
172. Works and Public Buildings—Abstract Accounts.
282. Vicarages and Curacies—Returns.
314. China (Votes of Credit)—Account.
338. Charlton's Charity (Ireland)—Return.
340. Landed Estates Court (Ireland)—Returns.
346. Army (Enlistments)—Return.
290. Sheffield and Bradford Reservoirs—Reports.
310. East India (Home Accounts).
339. Galway Extension Railway—Return.
345. Army (British North America)—Return.
131. Bill—Pilotage Order Confirmation.

SESSION 1863.

431. (A XI.) Poor Rates and Pauperism—Return (A.)

Delivered on 7th June, 1864.

333. Police Inquiry (Dundrum)—Letter of Complaint.
334. Ecclesiastical Commission (Ireland)—Annual Report and Account.
352. Sheep (Ireland)—Return.
353. Police (Scotland)—Report.

Patents.

From Commissioners of Patents Journal, June 24th.

GRANTS OF PROVISIONAL PROTECTION.

Bevel wheels, apparatus for cutting the teeth of—1399—J. Dodge.
Bobbin-net or twist-lace machines—1402—G. Berry and J. Litchfield.
Boots and shoes—1427—J. T. Crick.
Braiding machines—1440—F. Tolhausen.
Bricks—1446—J. Foxley.
Bridges and viaducts, construction of—1467—S. Calley.
Carding engines—1455—E. G. Fitton.
Carding engines, driving cylinders of—1385—T. Holden.
Carding and other machines, feeding—1414—R. A. Brooman.
Carriage-wheels, securing tires upon—1380—F. Ashe.
Charcoal, preparation of for sugar-refining—1336—J. Paterson.
Cloth-finishing, apparatus employed in—1460—W. Martin.
Clothes-washing, mangling, and drying apparatus—1397—G. E. Ellis.
Copper ores, smelting—1452—P. Spence and J. B. Spence.
Cotton, &c., preparation of for spinning—1439—J. Hardacre.
Cotton, &c., spinning machinery—1369—R. Threlfall & R. W. Pitfield.
Cotton gins—1410—W. Smith and J. G. Fildes.
Cotton-presses—1377—J. J. McComb.
Cotton seeds, machinery for treating—1480—F. A. E. G. de Massas.
Electro magnetic driving power—1386—W. Clark.
Electro-telegraphic apparatus—1458—J. McElroy.
Ferromanganese and cupromanganese, manufacture of—1366—O. E. Prieger.
Filaments, apparatus for producing—1394—G. Coles, J. A. Jaques, and J. A. Fanshawe.
Fire-arms, breech-loading—1389—T. Wilson.
Fire-arms, breech-loading—1437—H. W. Hayden.
Fire-arms, breech-loading—1465—E. Pope.
Fire-lighting fagots—1459—W. E. Gedge.
Fuel, artificial—1426—F. H. Warlich.
Gas, increasing the illuminating power of—1286—R. A. Brooman.
Gas, purifying—1456—W. Sharp.
Gas regulators, &c.—1436—M. Henry.
Gases, pressure of—1447—C. W. Siemens.
Grain separator—1257—A. B. Childs.
Granular matters, apparatus for separating—1433—R. Rowat.
Hats, &c.—1419—A. A. Larmuth.
Heating buildings, boilers used in—1400—B. E. M. Crook.
Horse-shoes, machinery for making—1429—A. V. Newton.
Hydraulic motive power—1393—W. T. Chectham.
Hydro-carbons, &c., destructive distillation of—1368—W. Cormack.
Iron and steel, manufacture of—1434—J. Onions.
Iron and steel, welding—1435—W. C. Corsan.
Iron ships and ships' sheathing, preservation of from fouling—1486—R. Whiteside.
Lanterns—1451—W. Abbott.
Leather-cutting machine—1367—P. A. L. de Fontainemoreau.
Liquid manure and water carts—1425—T. Richards.
Looms, temples for—1428—A. Tweedale.
Malt-drying—1308—L. Stevenaux.
Mashing apparatus for brewers—1370—W. H. Mellor.
Mathematical instruments—1454—H. R. de St. Martin.
Metals, separating from ores—1401—J. Napier.
Oils, refining—1390—F. Tolhausen.
Optical instruments—1149—A. Rieder.
Ordnance—1398—J. Snider, jun.
Petroleum and its products, treating—1387—B. Azulay.
Phosphates of ammonia—1408—W. Clark.
Photographic pictures, treatment of—1438—N. Sarony.
Pianofortes, tuning—1482—R. A. Brooman.
Picture-frames, &c., apparatus for manufacture of—1466—T. Agnew.
Planing machines—1384—W. E. Newton.
Portmanteaus, &c., handles for—1422—J. Parkes.
Purses, &c., fastening for—1382—A. H. Williams.
Pulley-blocks and sheaves—1474—W. E. Newton.
Rags, separating animal substances from—1418—A. T. Weld and J. F. Powell.
Railways, engine-pits for—1461—R. A. Brooman.
Railway telegraphs, signals, &c.—680—W. A. von Kanig.
Refrigerators for marine steam-engines—1376—W. E. Newton.
Rock-boring apparatus—1472—W. Tregay.
Rotary pumps—1371—E. Myers.
Sanitary apparatus—1416—J. Beck.
Screws for lifting, &c.—1423—A. Bragg and G. W. Bridgeman.
Seed-sowing machines—1381—J. B. Heal.
Self-acting mules—1388—W. Houghton and C. Oldroyd.
Ships, sheathing—1468—J. Brown, J. T. Way, and T. M. Evans.
Ships' propellers—1383—W. Calvert.
Signals for coal mines—1354—T. Eckersley.
Steam cultivation—1407—T. Aveling.
Steam generators—1463—J. G. Marshall.
Steam engines—1160—E. R. Handcock.
Steam-engines, pumps, &c., apparatus applicable to—1350—J. M. Stanley and J. Stanley.
Steam-engines, apparatus for working the valves of—1478—C. Taylor and J. Dow.
Steam and air engines—1445—W. H. James.
Steam generators—1424—J. H. Johnson.
Steering apparatus—1432—R. Aldridge.
Stoves and fireplaces—1469—G. A. Burn.
Tubular articles, manufacture of—1378—J. A. Jaques & J. A. Fanshawe.
Traction engines—1379—J. W. Lee.
Taps or cocks—1396—H. Hill.
Tea, &c., apparatus for obtaining extracts from—1406—E. Loysel.
Telegraphic printing apparatus—1412—H. A. Bonneville.
Tool grinding machine—1411—W. Avery.
Weaving ornamental fabrics—1392—J. Smith.
Window curtains, arranging and actuating—1415—J. Fraser.
Window-blinds, rollers for—1449—S. Tuchet.
Wire, annealing—1442—J. P. Williams and T. Robinson.
Wool, &c., production of slivers of—1470—B. Fothergill.
Umbrellas and parasols—1441—W. Hugo.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Grain, grinding or pulverising—1536—H. A. Bonneville.
Millstones, fitting and working spindles in—1481—G. S. Hooker.

PATENTS SEALED.

3275. E. Lindner.	3309. J. Radley.
3277. E. Bramall.	16. W. Balk.
3283. T. Bourne.	29. J. H. Whitehead.
3286. H. Bayley.	107. G. Burt.
3287. W. Whitaker & W. Tongue.	133. C. A. Beckman.
3297. J. Patterson.	611. H. N. Penrice.
3298. W. E. Gedge.	757. A. Staples.
3305. R. Bell.	759. J. Warburton.
3308. A. Byrnes and H. Byrnes.	

From Commissioners of Patents Journal, June 28th.

PATENTS SEALED.

3307. J. Dale and H. Caro.	198. W. E. Newton.
1. J. Holden.	214. W. E. Newton.
7. C. Martin.	390. H. W. Wood.
19. J. Bullough.	391. J. Huntington.
24. G. Speight.	436. W. C. Page.
28. J. B. Fenby.	524. A. V. Newton.
31. J. Williams & G. Bedson.	853. W. E. Newton.
44. A. M. Basset and L. N. D. Lamoureux.	1087. F. C. Hills.
61. M. B. Westhead.	1088. F. C. Hills.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1648. M. Henry.	1628. J. Fowler, jun.
1599. T. R. Harding.	1626. A. Sacre.
1653. J. W. Graham.	1634. J. R. Tussaud and F. C. Tussaud.
1617. H. B. Barlow.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1752. D. Evans.	1829. A. Spottiswoode.
1754. J. S. Rousselot.	1783. J. Ingham, E. Ingham, and B. Ingham.
1812. W. E. Newton.	1794. R. Hattersley.
1826. I. C. Cloet.	
1830. W. Pole.	

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, JULY 8, 1864. [No. 607. Vol. XII.

Announcements by the Council.

Council Meeting.

Wednesday, 6th July, 1864.

At the first Meeting of the present Council since their election, William Hawes, Esq., Vice-President, was unanimously re-elected Chairman for the current year.

Proceedings of the Society.

CANTOR LECTURES.

"On Chemistry Applied to the Arts." By Dr. F. Crace Calvert, F.R.S., F.C.S.

Lecture I.

Delivered on Thursday Evening, March 31st, 1864.

Bones. – Composition of raw and boiled bones. The manufacture of superphosphate of lime. Application to agriculture. Bone-black or char, and its use in sugar refining. *Phosphorus*, its properties, extraction and employment in manufacture of matches. *Horn* and *ivory*, their composition and applications.

I shall not take up your time by making many preliminary remarks, but merely state that though the heads of the subject on which I intend to speak are not inviting ones, still we shall find as we progress that the study of the various matters which I shall bring before you is full of interest and instruction. Further, it would be difficult to name subjects which better illustrate the ability of man to turn to profitable account the various materials placed in his hands, or to mention substances which have received more complete and skilful applications than those we shall treat of this evening.

Bones.—The composition of "green bones," or bones in their natural state, may be considered under two general heads, viz.:—the animal matters, consisting of a substance called osséine and a few blood-vessels, and the mineral matters, chiefly represented by phosphate of lime and a few other mineral salts. The composition of bones has been examined by many eminent chemists, but the most complete researches are those published in 1855 by Mr. Fremy, who examined bones, not only from various classes of vertebrated animals, but also from different parts of the same animal; and to enable you to appreciate some of his conclusions, allow me to draw your attention to the table in the next column.*

The first conclusion drawn by Mr. Fremy from these researches, is that he found a larger proportion of mineral matter than is generally admitted by chemists. Secondly, that there is no material difference in the composition of various bones taken from different parts of man, or of any one animal, but that age has a very marked influence on composition. Thus, in the bones of infants there is more animal and less mineral matter than in the adult, whilst in old age there is more mineral and less animal matter than in the middle-aged man. The mineral substance which chiefly increases in old age is carbonate of lime. Lastly, he could find no marked difference between the bones of man, the ox, calf, elephant, and whale; whilst in the bones of carnivorous animals and those of birds there is a slight increase in the amount of mineral matter. Allow me now to call your attention to a most interesting query. I hold in one hand the mineral matter only of a bone, which you can see retains perfectly its original form, and in the other hand I have the animal matter only of a similar bone, which also retains the form in which it previously existed, but is flexible instead of rigid. The question, therefore, arises, whether the strength and hardness of bones proceed from these two kinds of matter being combined together, or are their respective molecules merely juxtaposed? The answer is, the latter; for, as you see by this specimen, the mineral matter has been entirely removed without deforming the animal texture. Further, in the fœtus it is found that the bones contain nearly the same proportions of animal and mineral matters as those of the adult. Also, it has been observed by Mr. Flourence and other eminent physiologists, that the wear and tear of bones during life is repaired by the formation of new bone on the exterior surface of the bone, while the old substance is removed through the interior duct, and that the composition of the new layer is the same as that of the original bone. Let us now proceed to examine the chemical properties of the various substances composing bones, and some of the various applications which they receive in arts and manufactures. The general composition of bones may be considered to be as follows:—

Composition of Bones.

Name of Bone.	Mineral matter.	Phosphate of Lime.	Phosphate of Magnesia.	Carbonate of Lime.
Femur — Fœtus 6 months	63·0	58·9		5·8
,, Boy 18 ,, ...	61·6	58·0	0·5	2·5
,, Woman 22 years	60·1	59·4	1·3	7·7
,, Man 30 ,, ..	63·2	57·7	1·2	9·3
,, ,, 40 ,, ...	64·2	56·3	1·3	10·2
,, Woman 80 ,, ...	64·6	57·1	1·2	7·5
,, ,, 97 ,, ...	60·8	51·9	1·3	9·3
,, Lion (young)	64·7	60·0	1·5	6·3
,, Sheep..................	70·0	62·9	1·5	7·7
Sperm Whale	62·9	51·9	0·5	10·6
Ostrich	70·0			
Carapace of Turtle	64·3	58·0	1·2	
Codfish.....	61·3			
Stag's horn	61·9	58·1	traces	3·8
Cow's tooth Bone.........	67·1	60·7	1·2	2·9
,, ,, Enamel ...	96·9	90·5	traces	2·2
,, ,, Ivory	74·8	70·3	1·3	2·2
Scales of the Carp	34·2	33·7	traces	1·1

Bones.

Organic Substances.	Blood-vessels	....	1
	Osséine	....	32
	Fatty Matters	....	9
Mineral Substances.	Water	....	8
	Phosphate of Lime	....	38
	Phosphate of Magnesia	....	2
	Carbonate of Lime	....	8
	Divers Salts	....	2
			100

* Annales de Chimie et Physique. Vol. xliii, pp. 79, 83, 84.

The above-named animal matter, *osseine*, C 50·4, H 6·5, N 16·9, O 26·2, and which has been erroneously called gelatine, is insoluble in water, weak acids, and alkalies, whilst gelatine presents properties directly the reverse. But what has led to this popular error is that osséine, when boiled in water, becomes converted into the isomeric substance commonly called gelatine. As I shall have to dwell on this substance at some length in my next two lectures, I will not detain you now further than to state that osseine is obtained from bones by placing them in weak hydrochloric acid, which dissolves the phosphate of lime and other mineral salts, washing the animal substance osseine until all acid is removed, drying it, and treating it with ether to remove fatty matters. I cannot leave this subject without remarking on the extraordinary stability of this animal substance, for it has been found in the bones of man and animals after many centuries, and even in small quantities in fossil bones.

The fatty matter of bones is made useful in the manufacture of soap, railway grease, and for other purposes; it is obtained by taking fresh bones (as bones which have been kept a long time will not yield their grease easily) and placing the spongy parts, or ends of the bones, (where most of the fatty matter exists) in large boilers filled with water, which is then carried to the boil, when a part of the osseine is converted into gelatine and the fatty matter liberated rises to the surface, and is easily removed. The bones thus treated are called boiled bones, and receive many important applications, to which your attention will be called in a few minutes. Benzine and bisulphuret of carbon have been used as substitutes for water in the above operation, but the advantages do not seem to have been sufficient to lead to their general adoption.

Mineral Matter of Bones.—These, as the foregoing tables show, are chiefly represented by phosphate and carbonate of lime. The immortal Berzelius was the first to establish the fact that phosphate of lime was the only substance possessing the properties necessary for the formation of bone, owing to the extremely simple chemical reactions which cause the soluble phosphates to become insoluble. Let us trace shortly the sources from whence we derive the large proportion of phosphate of lime which exists in our frames. Several of our most eminent chemists have proved the existence of phosphorus in sedimentary and igneous rocks, and the important part played by phosphorus in nature cannot be better conveyed to your minds than by this extract from Dr. Hofmann's learned and valuable Report on the Chemical Products in the Exhibition of 1862—"Large masses of phosphorus are, in the course of geological revolutions, extending over vast periods of time, restored from the organic reigns of nature to the mineral kingdom by the slow process of fossilization; whereby vegetal tissues are gradually transformed into peat, lignite, and coal; and animal tissues are petrified into coprolites, which, in course of time, yield crystalline apatite. After lying locked up and motionless in these forms for indefinite periods, phosphorus, by further geological movements, beomes again exposed to the action of its natural solvents, water and carbonic acid, and is thus restored to active service in the organisms of plants and lower animals, through which it passes, to complete the mighty cycle of its movements into the blood and tissues of the human frame. While circulating thus, age after age, through the three kingdoms of nature, phosphorus is never for a moment free. It is throughout retained in combination with oxygen, and with the earthy or alkaline metals, for which its attraction is intense." After these eminently philosophical views by Dr. Hofmann, I will proceed to call your attention to the application of bones to agriculture. Bones are generally used for manuring in one of these three forms:—1st. As ground green bones; 2nd. As ground boiled bones (that is, bones nearly deprived of their osseine by boiling under pressure, as I shall describe in my next lecture); 3rd. Superphosphate of lime.

Green or raw bones have been used on grass land for a long period, but their action is exceedingly slow and progressive, owing to the resistance of the organic matter to decomposition and the consequently slow solubility of the phosphate of lime in carbonic acid dissolved in water. What substantiates this view is that boiled bones are far more active than the above. It is found that from 30 to 35 cwts. per acre of these will increase the crops on pasture land from 10 to 20 per cent. in the second year of their application. But the great advantage which agriculture has derived from the application of bones as a manure, has arisen from their transformation into superphosphate of lime, especially applicable to root and cereal crops. To Baron Liebig is due the honour of having first called the attention of farmers (in 1840) to the importance of transforming the insoluble phosphate of lime of bones into the soluble superphosphate, rendering it susceptible of immediate absorption by the roots of plants, and of becoming at once available for their growth. These suggestions of Liebig were rapidly carried out on a practical scale by Messrs. Muspratt, of Lancashire, and J. B. Lawes, of Middlesex; in consequence of the valuable results obtained by them, the manufacture of artificial manures has gradually grown into an important branch of manufacture in this country. The manufacture of superphosphate of lime is so simple that any farmer possessing a knowledge of the mere rudiments of chemistry can make it for himself, by which he will not only effect great economy, but also secure genuineness of product. All he requires is a wooden vessel lined with lead, into which can be placed 1,000 lbs. of ground boiled bones, 1,000 lbs. of water, and 500 lbs. of sulphuric acid sp. gr. 1·845 (or concentrated vitrol), mixing the whole, and stirring well for about twelve hours. After two or three days a dry mass remains, which only requires to be taken out and placed on the land by means of the drill, or to be mixed with water and sprinkled on the land. When very large quantities of this manure are required, the plan devised by Mr. Lawes appears to me to be the best. It consists in introducing into the upper end of a slightly-inclined revolving cylinder a quantity of finely-ground boiled bones, together with a known proportion of sulphuric acid of sp. gr. 1·68. As the materials slowly descend by the revolution of the cylinder they become thoroughly mixed, and leave it in the form of a thick pasty mass, which is conducted into a large cistern capable of containing 100 tons, or a day's work. This is allowed to remain for twelve hours, when it is removed, and is ready for use. Most manufacturers find it necessary to add to the phosphate of lime of bones other sources of phosphates, such as coprolites, or the fossil dung of antediluvian animals which have been found in large quantities in Suffolk, Cambridgeshire, and elsewhere, and contain from 36 to 62 per cent. of phosphate of lime, and from 7 to 38 per cent. of organic matter. Others employ a mineral substance called apatite containing about 92 per cent. of phosphate of lime, and found also in large quantities in Spain, Norway, France, &c. Others, again, employ guanos rich in phosphate of lime, such as those of Kooria Mooria Islands and Sombrero phosphates. The following is the average composition of the superphosphate of lime of commerce:—

Soluble Phosphate	22	to	25	per cent.
Insoluble ,, ...	8	,,	10	,,
Water	10	,,	12	,,
Sulphate of Lime	35	,,	45	,,
Organic Matter...............	12	,,	15	,,

Nitrogen 0·75 to 1·5 per cent.

The valuable and extensive researches of Messrs. Lawes and Gilbert, and Messrs. Boussingault and Ville, have not only demonstrated the importance of phosphates to the growth of cereal and root crops, but also that phosphates determine in a great measure during vegetation the absorption of nitrogen from the nitrates or from ammonia, as will be seen by the following table:—

Amount of Nitrogen fixed by Wheat under the Influence of the following Salts:—

	Without Nitrogenated compounds.	With Nitrogenated compounds.
Phosphate of Lime and Alkaline Silicate ...	8·15	20·08
Phosphate of Lime	7·25	19·17
Earths and Alkaline Silicates	5·71	11·16
Earth	3·00	9·50

Bone-black or Char.—In 1800, Löwitz made the interesting observation that wood charcoal possesses the remarkable property of removing colouring matters from their solutions. In 1811, Figuier also observed that animal black has far greater decolorating power than wood charcoal, and bone-black has consequently become one of the principal agents in sugar-refining, and has been the means, more than any other substance, of producing good and cheap white sugars. To give you an idea of the extent to which bone-black is used at the present day for decolorating purposes in the refining of sugar, I may state that in Paris alone it is estimated that about 11 million kilogrammes of bones are used annually for that purpose. The preparation of bone black is simple in principle. It consists in placing in cast iron pots about 50lbs. of broken boiled bones, that is, bones which have been deprived of their fat—of most of their osséine, and piling these pots in a furnace, where they are submitted to a gradually rising temperature, during 24 hours, such as will completely decompose the organic matter, but not so high as to partly fuse the bones and thus render them unfit for their applications. But a more economical process is generally adopted. It consists in introducing the crushed bones into horizontal retorts, which are themselves in connection with condensers, the ends of which are brought under the retorts to assist by their combustion in the distillation of the animal matter. By this arrangement not only is char obtained, but oily matters which are used by curriers, and also ammoniacal salts employed in agriculture and manufactures. The extraordinary decolorating action of animal blacks may be considered as partly chemical and partly mechanical—mechanical because it is proved, by some interesting researches of Dr. Stenhouse, to which I shall refer further on, that the action is due to the minute division of the carbon and the immense surface offered by its particles to the coloring matter, char being composed of 90 parts of mineral salts to 10 per cent. of carbon. On the other hand, the action is proved also to be chemical, by the fact that water will not remove the coloring matter, whilst a weak solution of alkali will dissolve it. Dr. Stenhouse's valuable researches not only illustrate fully this fact, but also prove the possibility of producing artificially substitutes for bone-black. In 1857 he published a paper describing the production of an artificial black, called by him aluminized charcoal. This he obtained by mixing intimately, and heating, finely pulverized charcoal and sulphate of alumina, when he obtained a powerful decolorating agent containing 7 per cent. of alumina, and well adapted for decolorating acid solutions, such as those of tartaric and citric acids, in chemical works. He also prepared what he called coal-tar charcoal, by melting one pound of pitch in a cast-iron pot, adding to it two pounds of coal-tar, and mixing intimately with it seven pounds of hydrate of lime, then carrying the whole to a high temperature, allowing it to cool, removing the lime by washing the mass with hydrochloric acid, and then with water, when carbon in a high state of division was obtained, possessing powerful decolorating properties. The following series of experiments by Dr. Stenhouse perfectly illustrate the chemico-physical action of animal black as a decolorating agent. He boiled a certain amount of char and his two charcoals, with a solution of logwood, then treated each black separately with ammonia, when the following results were obtained: Aluminized charcoal yielded no colour. Bone-black but a slight amount. Coal-tar charcoal, large quantities. But it would be wrong in me to leave you under the impression that animal black can only remove colours from solutions. Purified animal black, that is to say, animal black deprived of its mineral matters by the action of muriatic acid and subsequent washing, has the power of removing certain bitters from their solutions. Thus Dr. Hofmann and Professor Redwood applied this property with great skill, some years ago, to the detection of strychnine in beer. Again, Mr. Thos. Graham, Master of the Mint, published a most interesting series of researches, in which he established the fact that purified animal black had the power to remove a great number of saline matters from their solutions, such as the salts of lime, lead, copper, &c.

Revivification of Bone Black.—After a certain quantity of syrup sugar has percolated through the cylinders containing bone black, the interstices become so clogged with impurities that it loses its power of decolorating the syrup. Sugar refiners are therefore in the habit of restoring the power of their bone black, generally speaking, by submitting it to a process of calcination, which volatilizes or destroys the organic matter fixed by the char. It has been proved by experience that char may undergo this operation about 20 times before its pores become so clogged with dirt as to render it useless. [Here the lecturer described, with the aid of drawings, several of the various apparatus used in sugar refineries for the above process, alluding particularly to that of Messrs. Pontifex and Wood, by which a ton of char is revivified every 24 hours.] A new process, however, has been devised by Messrs. Leplay et Cuisinier, which as a whole deserves the attention of refiners, though I am aware that several of the details of their process have been used for some time. The char which has served its purpose in the cylinders, instead of being removed, is treated at once by the following processes. It is first thoroughly washed, treated by steam to remove all viscous substances, then a weak solution of alkali is allowed to percolate through the char, which removes saline matters and a certain amount of colouring matter, when it is further acted upon by weak hydrochloric acid, which in removing a certain amount of the lime salts liberates the colouring matters, the char is again washed with weak alkali to remove the remaining colouring matter, and lastly the decolorating power of the black is restored by passing through it a solution of biphosphate of lime. It is to be hoped that the high praise bestowed upon this process on the Continent may induce our manufacturers to try it, as they would obtain two distinct advantages by its use:—First, the economy of operating at once upon the black and restoring its properties without removing it from the cylinders: Secondly, the prevention of the noxious odours given off during the revivification of char by the ordinary methods. It is interesting to note one of the results of the different employment of char in this country and on the continent. In England the wear and tear in sugar refinery is constantly repaired by the introduction of fresh char, and there is no spent or old char for sale. In France, on the contrary, owing to the great impurities in their beet-root sugar syrups, and to the use of blood in refinery, the char becomes rapidly clogged with organic matter, and is so completely animalized, that its value as a manure exceeds what the char originally cost the refiner. The result is that French "spent" char is annually exported to the French colonies to the amount of 120,000 tons, and is there used as a manure to promote the growth of the sugar cane. So important is this article of commerce considered, that the French government have appointed special analytical chemists to determine its value for the trade.

Phosphorus.—I am now about to call your attention to one of the most marvellous and valuable substances ever discovered by chemists. In 1660, Brandt, a merchant of Hamburgh, discovered a process for obtaining phosphorus from putrid urine, but though he kept his secret, a chemist named Künckel published the mode of obtaining it from this fluid. A hundred years later, Gahn discovered the presence of phosphorus in bones; and Scheele

shortly afterwards gave a process to obtain it therefrom. The process devised by this eminent chemist was shortly afterwards improved upon by Nicolas and Pelletier, and their method was so completely worked out by Fourcroy and Vauquelin, that it is still the process used in the present day. The preparation of phosphorus consists of 4 distinct operations:—1st, 80 parts of thoroughly calcined and pulverised bones are mixed with 80 parts of sulphuric acid, sp. gr. 1·52, to which is then added 400 parts of boiling water; 2ndly, after a few days the clear liquor, containing bi-phosphate of lime, is removed from the insoluble sulphate, and evaporated until it has the specific gravity of 1·5; 3rdly, this liquor is mixed with 20 per cent. of finely-pulverised charcoal, and the whole is dried at a moderately high heat, when, 4thly, it is introduced into an earthenware retort, placed in the galley furnace, and on heat being slowly applied phosphorus distils, and the operation is continued at a high heat for two or three days. It is, however, necessary that the phosphorus thus obtained should be purified, and this is effected by melting the phosphorus under water, and pressing it through a chamois skin. It is then boiled with caustic alkali to remove other impurities, but what is still better is to heat the phosphorus with a mixture of bichromate of potash and sulphuric acid. The phosphorus thus purified is drawn through slightly conical glass tubes by the suction of a caoutchouc pouch, or is allowed to run by an ingenious contrivance into tin boxes. As will be seen by the following formula, the manufacturer only obtained from the bones one-half of the phosphorus they contain:—

$$\underset{\text{Bone phosphate of lime.}}{2(PO_5, 3\,CaO)} + \underset{\text{Sulphuric acid.}}{4\,SO_3\,HO} = \underset{\text{Acid phosphate of lime.}}{2(PO_5\,CaO, 2\,HO)} + \underset{\text{Sulphate of lime.}}{4(SO_3\,CaO)}$$

$$\underset{\text{Bi-phosphate of lime.}}{2(PO_5\,CaO)} + \underset{\text{Carbon.}}{5\,C} = \underset{\text{Pyrophosphate of lime.}}{PO_5\,2\,CaO} + \underset{\text{Oxide of Carbon.}}{5\,CO} + \underset{\text{Phosphorus.}}{P}$$

Consequently many attempts have been made to devise a chemical reaction by which the whole of the phosphorus might be secured. The most successful attempt of late years is that made by Mr. Cary-Montrand, whose process is based on the following chemical reaction:—

Action of Hydrochloric Acid on Bone Phosphate.

$$\underset{\text{Bonephosphate of Lime.}}{2(PO_5\,CaO)} + \underset{\text{Hydrochloric Acid.}}{4HCl} = \underset{\text{Acid Phosphate of Lime.}}{2(PO_5, CaO, 2HO)} + \underset{\text{Chloride of Calcium.}}{4CaCl}$$

Action of Hydrochloric Acid on Biphosphate.

$$\underset{\text{Biphosphate of Lime.}}{2(PO_5, CaO)} + \underset{\text{Hydrochloric Acid.}}{2HCl} + \underset{\text{Carbon.}}{12C} = \underset{\text{Chloride of Calcium.}}{2CaCl} + \underset{\text{Oxide of Carbon.}}{12CO} + \underset{\text{Hydrogen}}{2H} + \underset{\text{Phosphorus.}}{2P}$$

He arrives at this result by treating calcined bones with hydrochloric acid; the liquor is then mixed with charcoal, and the whole dried at a moderate heat. The prepared mass is then introduced into cylinders through which a stream of hydrochloric acid is made to percolate, and, as shown above, chloride of calcium, hydrogen, carbonic oxide, and two proportions of phosphorus are produced. (The process of Fleck was also described.) Phosphorus prepared and purified by the above processes is a solid, semi-transparent body, having a sp. gr. 1·83, fusing at 110·5° F., and boiling at 550°. It is so inflammable that it ignites in the open air at several degrees below its fusing point; but Professor Graham made, some years ago, the interesting observation that this slow combustion of phosphorus could be entirely checked by the presence of certain combustible vapours. Thus he found that one volume of vapour of naphtha in 1,820 of air, or one volume of vapour of oil of turpentine in 4,444 of air, completely prevented the spontaneous combustion of phosphorus. Further, phosphorus presents the curious property, that, if heated to 160°F. and suddenly cooled, it becomes black, and if heated to 450° or 460° for several hours, it becomes amorphous, and of a dark brown colour. This allotropic state of phosphorus, first noticed by Schrotter, has enabled it to render great service to society, owing to its not being spontaneously inflammable (as in fact it only becomes so at a temperature approaching its point of fusion), and also to its not being poisonous, so that it can be substituted for common phosphorus in the manufacture of matches with great advantage. Lastly, owing to this brown amorphous phosphorus not emitting any vapours, those employed in the manufacture of chemical matches now avoid the risk of the dreadful disease of the jaw-bone, called phospho-necrosis. Notwithstanding the great difficulties attending the manufacture of this valuable product, Mr. Albright, of Birmingham, has, with praiseworthy perseverance and great skill, succeeded in obtaining it perfectly pure on a large scale, and at such a price as to bring it within the scope of commercial transactions.

Chemical Matches.—Although I do not intend to enter at great length upon this subject, yet as it is a highly important one, I deem it my duty to lay a few facts before you. The first application of chemistry to the discovery of a substitute for the old tinder-box of our fathers, was made in 1820, when the sulphuretted ends of matches were covered with a mixture of chlorate of potash, lycopodium, and red lead, and the matches so prepared were dipped into asbestos moistened with sulphuric acid. In 1836, lucifer matches were first introduced, and the explosive matches were soon followed by the non-explosive ones. The composition of these matches is as follows:—

	Non-Explosive.	Explosive.
Phosphorus	25 or 30	9 or 4
Red lead	5 ,, 20	16 ,, 3
Nitre	0 ,, 0	14 ,, 10
Sand	20 ,, 20	
Vermillion	1 ,, 0	
Gum or glue	20 ,, 25	16 ,, 6

The danger as well as the disease attendant on this manufacture was greatly mitigated by Professor Graham's discovery of the property of turpentine vapour already alluded to. Until lately the only successful application of amorphous phosphorus to lucifer matches was that of Messrs. Coignet, Frères, of Paris, who caused a rough surface to be covered with it, and so prepared their matches that they would not ignite except when rubbed upon the prepared surface. Similar matches, under the name of "special safety matches," have also been introduced into this country of late by Messrs. R. Letchford and Co., who have also effected several important improvements in this branch of manufacture, in one of which paraffin is made use of to carry combustion to the wood, instead of sulphur, which gives rise to the noxious fumes of sulphurous acid, and as the substitution is made by Messrs. Letchford without any increase of cost, the price of these matches is as low as that of the common ones. These gentlemen have also found the means of diminishing the amount of phosphorus used to a very considerable extent, so that the disagreeable smell of this substance is also avoided. But the greatest improvement that Messrs. Letchford have made is in what they call their hygienic matches, or lights, in which for the first time amorphous phosphorus is substituted for ordinary phosphorus, and in small quantities. The advantage of these matches cannot be overrated, for children can eat them with impunity, as amorphous phosphorus is not poisonous; they are not nearly so combustible, and therefore not so likely to cause accidental fires; and lastly, all source of injury to the health of those employed in the manufacture is removed. I cannot leave this subject without still drawing your attention to one or two important facts. Messrs. Hochstetter and Canouil, besides others, have lately introduced chemical matches free from phosphorus, which are stated to have the following composition:—

Chlorate of Potash	10	10	10
Hyposulphite of Lead	26	26	20
Peroxide of Lead	...	9·8	...
Peroxide of Manganese	...	...	33·6
Chromate of Lead	17	4	8·8
Gum Arabic	4	4	4

An important improvement in the manufacture of chemical matches is the reduction of the proportion of phosphorus to a minimum. This is effected by reducing the phosphorus to an infinitesimally minute division, by which the manufacture is rendered more economical, and the matches, when ignited, have less of the unpleasant odour of phosphorus. This division is accomplished by using a solution of phosphorus in bisulphuret of carbon, by which a saving of 19-20ths of the phosphorus is obtained. Another invention is that of Messrs. Puscher and Reinsch, who have proposed the employment of sulphide of phosphorus.

Ivory.—The lecturer, having given some details respecting the properties of ivory, said—I will now call your attention to the substitution of the following mixture for ivory tablets as applied in photography. Finely-pulverized sulphate of baryta is mixed with gelatine or albumen, compressed into sheets, dried, and polished; these sheets are ready for use in the same way as ivory plates. You are all doubtless aware that the nut of the *Phytolephas macrocarpa*, of the palm tree tribe, has for many years been used in this country as a substitute for ivory, and it may be interesting to you to be made acquainted with the two following facts, viz., that the nut is composed of—

Pure cellulose	81	per cent.
Gum	6	,,
Nitrogenated principles	4	,,
Water	9	,,
Total	100	

and Dr. Phipson has recently published a method of distinguishing this vegetable ivory from the animal one by means of sulphuric acid, which gives a beautiful purple colour with the vegetable ivory but none with the animal ivory.

Horn.—Horns of the best quality, and especially the beautiful ones obtained from the buffaloes in India and America, receive a great variety of applications at the present day, owing to their great toughness and elasticity, as well as to their remarkable property of softening under heat, of welding, and of being moulded into various forms under pressure. To apply horns to manufactures they are treated as follows:—They are first thrown into water, and slight putrefaction commences, by which ammonia is produced, when the horn begins to soften. To carry this action further the horns are transferred into a slightly acid bath, composed of nitric and acetic acids, with a small quantity of various salts. When the horns are sufficiently softened, which requires about two weeks, they are cleaned and split into two parts by means of a circular saw, and these are introduced between heated plates, and the whole subjected to an intense pressure of several tons to the square inch. The plates may be moulds, and thus the horn may be compressed into any required shape. A great improvement has recently been effected in this branch of manufacture, which consists in dyeing the horn various colours. To accomplish this the horn is first dipped into a bath, containing a weak solution of salts of lead or mercury, and when the horns have been thus impregnated with metallic salts, a solution of hydrosulphate of ammonia is rubbed upon them, when a black or brown dye is produced. Another method consists in mordanting the horn with a salt of iron, and dipping it in a solution of logwood. Of late, very beautiful white fancy articles have been produced from horn by dipping it first into a salt of lead, and then into hydrochloric acid, when white chloride of lead is fixed in the interstices of the horn, which then simply requires polishing.

This lecture, as well as those which followed, were illustrated by numerous specimens and experiments.

Proceedings of Institutions.

FAVERSHAM INSTITUTE.—A circular has been issued by Mr. F. W. Monk, managing director, announcing that a Conference of representatives from various Institutes in Kent will be held at Faversham, on Thursday, July 17th, at twelve o'clock at noon. The advantages to be derived from the formation of a County Union of Educational Societies will be considered, and, should it be thought desirable, resolutions will be adopted in order to promote the establishment of an Association of Institutes in Kent. The Church of England Young Men's Institute, at Canterbury—the Chatham Mechanics' Institute—the Sheerness Literary Institute—the Deal Mutual Improvement Society—and the Faversham Institute, will be represented at the Conference; and it is hoped that many other Societies will send delegates. Should the Conference not consider the establishment of a County Association desirable, the representatives will be asked to express their opinions on such subjects as may be interesting to the Managers of Institutes.

NOTTINGHAM MECHANICS' INSTITUTION.—The twenty-sixth annual report speaks of steady progress. Fresh ground has been broken in the organization of classes, and in assistance given to the establishment of penny readings. The number of works issued from the library in 1862 and 1863 respectively, were 25,424 and 36,575, the number of volumes in the library being 6,642. The increase extends to every class, but is the largest in history, biography, travels, and the sciences, and very small in that in which the largest issue generally takes place, namely, novels and romances. 214 volumes have been purchased, and 23 presented, during this year. The following lectures have been delivered:—"The Authors of the Age: a Series of Written Portraits from Personal Acquaintance"—Mr. S. C. Hall; "English Notions of American Character," and "Humorous Characteristics"—Mr. G. Grossmith; "On the Art of Public Reading," and "Extempore Speaking"—Rev. A. J. D. D'Orsey, B.D., Cambridge; "On some Great Schoolmasters"—Mr. George Dawson, M.A. The classes go on satisfactorily. In the French class the quarterly payments have been 110, with an average attendance of 28 students. A class has been formed for the study of German, some twelve members having signified their intention of joining it. Dr. Wilson has resumed his studies as teacher of the Inorganic Chemistry class. The opening lecture was again delivered by Mr. J. C. Buckmaster. The number of students is not so large as at the first organization of the class. Arrangements were made by the committee for the formation of a class in Theoretical Mechanics. The members of the Discussion class number 34. Among other subjects introduced have been the following:—Literature of the Past Century—Literature of the Elizabethan Age—Items of the Obsolete—Cromwell—Forms of Government—Poems of "Rusticus"—Thomas Chatterton—Nottinghamshire Worthies—Notes on Practical Photography—Prose Composition—American War—and Capital Punishments. The chess class has 63 members. The receipts from the museum have been £58 13s. 9½d., including a balance of £14 6s. 0½d., and the expenditure £30 13s. 6½d., leaving a sum in hand of £28 0s. 3d. The visitors numbered 4,322, the payments for admission amounting to £18 0s. 2d. The members of the society are anxious that a commodious building should be erected for the purpose of a museum, to which the inhabitants of the town might have free admission. Lectures have been delivered on British Botany, the Physiology of the Skin, and Mental Phenomena, to which the members of the Mechanics' Institution were admitted without charge. The number of members is the same as last year within two. There is an increase of nine ordinary members, and a decrease of seven honorary and four life members, the latter, of course, by death. 173 persons have joined during the year, and 23 have transferred their shares. The operative classes are much more strongly represented than formerly. The total number is 1,139, of which 329 are clerks, shopmen, and warehousemen, 70 youths under 24 years of age, and 65 females. The balance-sheet shows that the receipts have been £782 15s. 4½d., and that there is a balance in hand of £101 9s. 8d.

Swindon (New) Mechanics' Institution.—The twentieth annual report shows a slight decrease in the number of members, being 1,027 against 1,032 of the previous year. The library now contains 3,358 volumes, comprising many valuable works upon science, history, geography, biography, &c. 10,358 books have been issued during the past year. The chess and draughts' room continues to be well attended. The dancing class is under the supervision of the Council, who state that it is ably conducted, and affords to the numerous members, by whom it is supported, a most agreeable recreation. The baths continue to be well attended, and conduce much to the health and comfort of the members. Amongst the lectures and other entertainments that have taken place during the year, may be mentioned a lecture by Wm. Clement, Esq., on "Little Dombey," and "Trial from Pickwick;" a concert by the New Swindon Choral Society; a lecture by C. Charles, Esq., on "Comic Characterization;" a Welsh and English Concert; and a lecture by T. Alfred Burr, Esq., on the "Electric Telegraph by Land and Sea." The lectures have not been very numerously attended. The members of the amateur dramatic club have greatly exerted themselves during the past season, and have given several select representations, which have afforded much pleasure and amusement. The choral class in connection with the Institution has given several excellent and successful concerts during the past season. The council express their gratitude to the employés of the Great Western Railway Company, who, during the past year, presented the Institution with a bust of its president, Daniel Gooch, Esq. The treasurer's account shows that the receipts have been £569 12s. 9d., and that there is a balance carried to the succeeding year of £130 9s. 7½d.

PROPOSED ART RESULT SOCIETY.

By C. Bruce Allen, Esq., Architect.

It is always to be more or less anticipated that all fresh ideas, or new modes of working old ideas, shall at first be somewhat misunderstood; it is so with this proposed "Result" Society, and its contemplated mode of action and hoped-for influence on the Fine Arts of the present time. It may therefore be useful to explain somewhat more in detail its contemplated and precise mode of action, and how far it would differ from the Art Educational societies, now existing, in its mode of working.

It is only within these very few years that the public attention has been called to the value and importance of the workman's share in the production of all objects of Fine Art, as, indeed, in all productive art. In ordinary productive work, such as machine making and the like, it has never been doubted that the workmanship—the executive workman's share in the object—is all important, and that, in the absence of executive skill, the inventor, designer, and draughtsman are almost if not wholly powerless. This has been always of necessity admitted, but in the modern mode of Fine-Art production this important element in all work has not been recognised, or perhaps hardly even thought of, as it has been the universal idea, till within these few years, *i.e.* since the period of the 1851 Exhibition, that the great need of the time in Fine-Art work is "design," as it is called. Indeed, but lately, in the summing-up of a series of lectures on Art-work Applied to Industry, the better education of the designer is the first thing urged as the way to higher and more artistic work. There can be no doubt that "design" comes first in order, for it is the means without which the ultimate end—the resultant work—is impossible; but by itself it is in reality powerless, and always supposes the executant power ready and able to realise it and embody it in material. This is at present impossible, for the means do not exist able to render in material the artist's design, which is always on a flat surface. Does it not seem therefore a waste of means and power to dwell thus on the importance of design, and to hold out all encouragement and help to it, without, in the first-place, doing something to provide that other absolute necessity in Art-work—the executive skill—and thus to render complete and sufficient the process necessary, *i.e.*—the working power as well as the drawing or indicative force? Would it not seem almost like beginning at the wrong end? There would, indeed, seem to be but little if any doubt, that it is much the easier problem of the two for a thoroughly able executive workman to learn to design, than it is for an equally able designer to acquire the power of actual executive skill, that is, to pass from paper to material. This proposition may, however, be doubted by some, but such may be reminded that nearly all that is left us of the art of bygone ages is in material of some kind or other, and that there is no evidence whatever to show that drawings of art objects were in the first place made as they now are, and that the art object itself was then executed from such drawings. Our modern process seems to have been reversed—the object was designed as well as executed in material, and if anywhere represented, as in wall paintings or in manuscripts, it is a copy of the art object itself, and not a design for it.

Thus it will be seen, the more attentively the subject is examined, that the one great and chief need of the present day in Art production is a return to the old method of working in material, and that perhaps the grand cause —after all the vigorous exertions made—of modern Fine Art failures has been and is the neglect of the workman. He it is who finally gives to the public the art of the time, and through him the designer and the draughtsman must work and evidence their capacity.

But all important as is the office of the workman in art, a yet more immediately pressing need at this moment is the practical recognition and encouragement, side by side with the workman, of the art draughtsman, viz., he who provides the executive workman with the necessary guide for his work, and without which he is at the present day almost helpless; and it is to this part of the subject the attention of the Society is asked.

It seems a somewhat singular thing that no effort has yet been made—in these days of inquiries and statistics—that no search has been instituted for the purpose of finding out who they are who produce all the multitude of designs and patterns which fill our shop windows, and where the designs and patterns come from. Let anyone pause for a few minutes before a window full of "woven fabrics," as they are learnedly termed, and notice the "designs." The most industrious book-hunter will in vain search for any evidence of "precedent" in the window show; all his book experience will fail to guide him to an origin of the odd and meaningless shapes he will see. It will be equally useless in the great majority of cases to go to natural forms and recollections for a solution of the problem, and he will be equally unable to conclude that they are each of them the product of pure individual inventiveness on the part of the designer and draughtsman —sheer original brain products. The longer he looks the more he wonders, and he moves on at last in sheer despair. They clearly come neither from precedent—old art—nature, nor the head of the draughtsman. If he should have confined himself to cheap shop-windows, a further search in dear shop-windows will not make a whit clearer the puzzling difficulty. In the largest and most expensive Bond-street shop window at this hour may be seen a pattern, on the very richest silk, produced, as it would seem, by dropping colour of the richest kind on the silk surface, and then before it has had time but to half dry, smudging the spots rapidly right and left with two fingers. The whole surface is covered with this design, and the unhappy purchaser, with all her money, is compelled to admire it and take it, or if not, the one next to it, which is perhaps even more fanciful; a few short sticks and twigs dipped in colour and thrown into a small heap, and stamped on the gauze surface, produce

the "new design." These are not cheap goods, nor made for a foreign market, but are solely for those who can pay and are ever on the look-out for the costliest and newest. Are not the men or women who do this worth a line of print in a statistical inquiry into our art manufactures?

It must be here borne in mind—it being the object of this notice to ask attention to it—that these and other patterns and designs are not the production of the workmen who weave or paint the fabrics, but are the works of the draughtsmen and designers in the factories; it is they who originally draw the pattern on paper for the wood or metal blocks, or card, a thing never yet seen in any public exhibition of art manufactures. These foolish performances would, if publicly exhibited, guide the public mind to a knowledge, and a valuable practical knowledge, of the lowest source of modern art designing, and to the condition of those who supply it. Not exhibitions, it must be understood, like those the Society have hitherto been in the habit of holding and seeing; but it must be, in this case of fabrics, of specimens of the three objects —the two *means* and the final *result, i.e.*, the original design or drawing on paper, the wood or metal block, which is, of course, by a workman, and a specimen of the silk or stuff itself. Thus would it be seen that in the art in the simplest and commonest stuff, there are never less than three executants—there are indeed more commonly four, for, in addition to the draughtsman on paper, there is another, a copyist, for the wood block. These things are really and truly named manufactures, and it will be seen that by the time the original art thought, whether good or bad, is ready for the public, the art in its originality is very thoroughly and effectually worked out of it. This lowest art is here noticed, not because it is the worst, but because it is in reality the newest and most inventive. John Bull is on his own resources—nineteenth-century resources. There are other things and patterns equally silly, such as the whole width of the silk covered with "fret" from the Parthenon, the musical stave and bars, an entire sheet of penny postage stamps! and so on. No designer or draughtsman would venture to exhibit such things as these on paper as specimens of his powers; and the hope is that when he and his productions are asked for as part of future art result exhibitions, that one step higher in originality and sense may be reached. And not only will the whole process of each manufacture be thus made evident, and a road perhaps found out of the present evil—that of being able to get nothing—but the why so much valuable artistic power is lost, will, in no length of time, become visible; for when the original idea, even when a good one, is seen to pass through so many various heads and hands, all differing from each other, it will be found that this is simply to lose and waste such art power, the original thought growing weaker and weaker as it is successively copied and re-copied by successively inferior artists. It will be very soon seen, too, that to manufacture original art is impossible, and that the only legitimate and certain way of getting, in an art work, the impression of the power and capacity and meaning of the artist, is that the artist should either himself execute the work, so that it shall be his and his only, or, which is the next and the second best way—for the artist to work side by side with the workman and to provide him directly with the guiding means or working drawing. It is for this end the Society may, it is thought, afford such kindly and valuable help, by the recognition of the artist draughtsmen now doing this work in our art shops and factories; and by abandoning the present idea of encouraging the copying of objects of antique art by artists who have passed away.

The Society happily has now taken up, as a regular part of its art work, the recognition and encouragement of the *bonâ fide* workman—this year especially, with so munificent a sum—the income, indeed, of two or three ordinary societies; it is now, therefore, respectfully urged to include in future years the artist-draughtsmen, who always in the art manufactories supply the workmen with the indicative means and working drawings so absolutely required by the actual workmen, and thus to complete its work. The great caution required is that of avoiding show drawings, or sketches, or water-colours, and to accept only the rough "working drawing" as it is termed, such working drawing to be the one really worked from by the art-workman in the manufacture of the object exhibited. In a short time this would evidence the great but hitherto unnoticed fact that the art of drawing in the past was that of the power to draw on material, and that all our present vast apparatus for teaching drawing, and efforts through it to get at an art result, is simply a modern mistake. The schools of design have now been in active existence for nearly a quarter of a century, but have not yet touched the shop windows, and for the simple reason that the whole scheme of art teaching aims at picture-making as an end, and teaches drawing as an end, and not simply as a means.

WATER SUPPLY OF NAPLES.

Signor Felice Abate, an Italian civil engineer, who obtained, in 1847 and 1855, two medals from this Society for inventions connected with his profession, has lately put forward a plan for supplying the city of Naples with water. Mr. John F. Bateman, F.R.S., engineer to the Manchester, Glasgow, and many other waterworks, having been invited to give his opinion upon the plan, has made the following report:—

"I have carefully considered your project for the restoration of the ancient Roman aqueduct of Claudius, and for supplying, by its means, the beautiful spring waters of Serino to the inhabitants of the City of Naples. With the full information which your plans and sections, and your written documents and personal explanations have afforded me, I have been enabled to make independent estimates of the probable cost of the undertaking. Pressing engagements prevent my writing at present as full a report on the subject as I could wish, but as my calculations are complete, I hasten to give you the general result, with such observations on the scheme as will put you in possession of my views and opinion, and enable you to bring the matter before your friends in this country. I shall be able, very shortly, to enter into fuller details.

"The City of Naples contains a population of between 400,000 and 500,000 persons. The present supply of water is, as I am informed, very small and quite insufficient, and many disadvantages, ill health, and mortality are the result; it is only 3,000,000 or 4,000,000 gallons per day, and is delivered at too low a level to supply the higher parts of the town. In so hot a climate as that of Italy a full and abundant supply should be estimated at the rate of 30 gallons per head per day, and ought on no account to be less than 20 gallons per head. The highest of these estimates would give a gross quantity of 15,000,000 gallons per day, and the smaller 10,000,000 gallons.

"Allowing for the present supply and supposing that to be still available for general purposes, preparation should be made in any new work of considerable extent for bringing at least 12,000,000 gallons of water per day, although a smaller quantity might possibly, in the first instance, be sufficient.

"The springs of Serino have been measured, and are estimated to yield, in the dryest periods of the year, 11,000,000 gallons per day, and an average of about double that quantity, or 22,000,000 gallons. In years of extraordinary drought, they fall below these quantities; but, from a consideration of the physical features of the district, and its geological formation, it is anticipated that much spring water which now issues at lower points may be intercepted, and the quantity available for Naples materially and permanently increased. By the construction, however, of store reservoirs to impound the surplus water of wet seasons, the larger quantity named above could certainly be obtained, but as 11,000,000 would,

in addition to the present supply, appear to be sufficient for some time, and may, as I understand, be safely relied upon, I will confine my estimate to the cost of obtaining this quantity, with preparation for increased supply when it may be required.

"The springs issue from limestone rocks at an elevation of about 1,200 English feet above the level of the sea, and at a distance of about 47 miles from Naples. They were originally conveyed to the city by the Claudian Aqueduct, about two feet seven inches wide and six feet high, with a varying inclination, finally entering the city at the Ponti Rossi, 136 feet above the level of the sea, at much too low a level for the supply of the higher parts of the city.

"You estimate, after careful examination of the whole aqueduct, that, with the exception of about thirteen miles, the whole is in sufficiently good repair, when properly cleaned out, to be again employed with perfect success for conveying the water to Naples, and you propose to overcome the defect of low elevation at the termination of the existing aqueduct by laying down, for the supply of the higher parts of the city, a line of pipes of sufficient diameter, which shall commence at a point near Petruro, high enough for the purpose. This point will be about thirty miles from Naples, at an elevation of about 660 feet above the sea, and the pipes will terminate at a point above the city near Antignano, about 490 feet above the sea.

"The first eight miles of the aqueduct will require reconstructing, and this length may be shortened to four miles, by which additional pressure can be brought into the tunnel through the mountain of Forino, which is nearly four miles in length. By this means the aqueduct would be equal to the passage of about twenty-five million gallons per day. From the lower end of this noble ancient tunnel there is a magnificent descent of 500 feet down the face of the mountain, from the foot of which the piping to the city would commence. From this point the water would be divided, the ancient aqueduct conveying about two-thirds, and the pipes the remainder. At the end of each a service reservoir would be constructed, each capable of containing about one week's supply, to provide against casualties and interruptions, and from these reservoirs the water would be distributed to the city. The whole of the water would be supplied by gravitation, without any cost for pumping, and all the necessary works are very simple and easy of construction. I estimate the total cost, including the restoration of the ancient aqueduct, new aqueduct where required, the main pipe of 24 inches diameter from Petruro (equal to a delivery of 4,000,000 gallons per day), the two service reservoirs, and complete distribution, the whole on the scale of 15,000,000 gallons per day, with 15 per cent. for contingencies, at about £620,000. To this sum must be added the cost of engineering, administration, interest during the construction of work, and other expenses. The whole work ought to be thoroughly well done, every expense included, for a sum not exceeding £750,000. This is a small cost for so large a population; it is 30s. per head for an abundant supply of water by gravitation, only one-half of the cost of the supply to Glasgow or Manchester.

"Taking the dry weather volume of the springs, the hydraulic power which would exist in the rapid descents of the aqueduct, the greater part of which could be utilised, would be about 1,200 horse power constantly. Probably a large portion of this would be converted to useful manufacturing purposes, as a railway now passes nearly alongside the aqueduct to the foot of the great fall below the tunnel of Forino. Here would be a source of income which would do much to reduce the cost to the city.

"On the whole I beg to congratulate you on the promising result of your project, and to express a hope than an undertaking of such immense importance to the prosperity and welfare of Naples may be successfully carried out. I am satisfied that it cannot fail at the same time to be highly remunerative to those who undertake it.'

Fine Arts.

Royal Scottish Academy.—At a meeting of the Council of the Academy on Monday, the 4th instant, George Harvey, Esq., the eminent landscape and historical painter, was chosen President of the Academy, in the place of Sir John Watson Gordon.

Excavations at Pompeii.—The steady perseverance of the present government brings new treasures to light almost daily. Last week only a fine bronze statuette of "Silenus" was disinterred from beneath the ruins of a wall. The style of this work is described as bearing a strong resemblance to that of the famous "Dancing Fawn," also discovered at Pompeii. Two large elegant and massive silver candelabra were also found in the same house with the "Silenus." Another very interesting discovery was made on the 24th of last month, when the lower part of a house, including a cellar, well, bath, and family altar, was laid open to view. Amongst the ashes on the altar was found a half-burnt pine cone, which was probably lighted before the "Penates" of the unhappy inhabitants at the moment of the grand catastrophe.

Photosculpture.—In the *Journal* a short time since, a notice was given of a new application of photography called "Photosculpture."* The process has been carried out with great success in Paris, and specimens executed there were exhibited by Mons. Claudet at the Royal Society's *soirées* this year, and attracted much admiration for their life-like and artistic character, as well as for the ingenuity displayed in this new application of photography to the purposes of sculpture. It is now proposed to carry out the invention in this country, and a company has been formed for this purpose, with Sir David Brewster as its chairman, and under the management of Mons. Claudet.

Manufactures.

Radial Railway Locomotive.—In the Library of the Society may be seen a model, to a scale of one-fourth the full size, of a locomotive engine frame, built by Mr. James Cross, engineer of the St. Helen's Railway, on the plans of Mr. W. Bridges Adams, upwards of twenty years a member of the Society. This is a tank engine, with a separate tender, and the longest ever built, being on eight wheels, with the extreme base twenty-two feet in length; consequently, the engine, by the mere fact of length without increased height, would, even if constructed in the usual rigid manner, increase in steadiness in proportion to its length. Such an engine, if constructed in the usual manner, would possess so much friction against the rails as to be nearly useless. But this improved engine is so constructed as to work freely on a double or reversed curve of 98 feet radius, equal to one chain and a half, as may be seen and tried with the model, the wheels of which *roll* and do not slide. On the curved line of rails, when the wheel flanges touch the rails, they yield laterally, by the axle boxes sliding in curved lines through the horn plates, so that the axles length-long are placed in lines radial to the curves of the railway, being always at right angles with the rails; the result is that the flange friction is prevented, and the risk of getting off the line by the flanges mounting the rails is removed. An engine altered to this plan is now working successfully on the North London Railway. It is not generally known that previous to the reign of Queen Elizabeth there were no four-wheeled carriages in England made to turn in a circle, *i.e.*, the axles were made rigidly parallel, and could not roll in curved lines, but only slide by great force. This structure, being that of the old Roman cars on four wheels, was one probable reason why the Romans made their roads in straight lines. And this

* *Vide* vol. xii., p. 71.

structure is precisely that of modern railway carriages, in which the movement is partly rolling and partly sliding, even on what are called straight lines, which are not straight as regards the rail surface, but a series of minute curves, while on curved lines the movement is nearly all sliding. In the improved engine the principle conforms to the common road practice, by permitting the axles to diverge from their parallelism, with the difference that the wheels on the common road are steered by the pole, or shafts, while on the railway the rails themselves perform the steerage. And thus lines of railway may be made with any desirable amount of curvature down to one chain and a half radius. Not that it is desirable to use lines of great curvature in preference to straight ones, when the cost is equal and other circumstances do not interfere, but it is very important to be able to avoid costly outlay by occasional sharp curves, and especially at termini, and to avoid wear and risk at points and crossings. And it is also desirable to form stations close to towns or in the interior, and in such circumstances this plan of radial axles furnishes the facility of turning round the corners of wide streets if necessary. And, moreover, as the length of the machine ceases to be an injury and becomes an advantage, the engine can run either end foremost with equal facility and safety; and as experiments have proved that the engines with radial wheels run with the greatest steadiness on straight lines, and by the diminution of friction develope the greatest amount of duty, it is probable that this will be found the best construction both for express trains and for heavy loads. The same principle applied to trains diminishes their resistance, and samples of carriage construction may be seen in the library, as well as specimens of elastic permanent way, a system tried for a considerable period on the North London Railway, demonstrating a fact little understood, but very important to shareholders, that the destruction of rails arises less from the friction of the iron than from blows or concussion, which disintegrates the scrap iron of which they are composed. It is found practically that where the blows are eluded by the elastic principle no disintegration takes place, and that iron rails under such circumstances may be more durable than steel applied in the usual rigid mode. A paper treating of the whole subject will probably be read by the author of the system during the next session.

Commerce.

American Cotton.—The *Boston Advertiser* gives a table showing the receipts in England, in 1862 and 1863, of cotton which can properly be assumed to be American. It appears that while the direct receipts from Southern ports have fallen off largely, those from the Bahamas and Bermudas have enormously increased, thus showing the route which the Confederate trade follows. The islands which figure in the British returns are the ports of transhipment. Large steamers are loaded in England for these islands and there exchange cargoes with the small blockade-runners. Information from England shows that one-half of each cargo is for the account of the Confederate Government, and one-half to the owners; the latter not being allowed, however, to ship any supplies not absolutely needed in carrying on the war. So far as the sales of prize cotton show, it does not appear that the blockade runners are intercepted in more than one trip out of six. From reliable computations it appears that in 1863 130,000 bales of cotton were available in England for the Confederate Government or its supporters, for the purchase of supplies or munitions of war. This cotton was sold for gold at a rate not less than 200 dollars per bale, producing at least 26,000,000 dollars. The Confederate Government, with its share, doubtless paid the interest upon its bonds, and recruited its credit so far as to make the 26,000,000 dollars equal to double its amount in purchasing arms and supplies. Used in this effective manner, the cotton was sufficient to arm, clothe, and set in the field an army of 400,000 men.

Horse-fed Poultry.—Poultry is a very important item of consumption in France, and consequently any method of producing delicate chickens, juicy poulets, and fat capons at a moderate price, offers an attractive subject of consideration in more respects than one. It has been observed that poultry does not thrive best on a pure grain diet, but that, on the contrary, a mixture of animal matter has great advantages. Acting upon this hint, or rather starting from it, and proceeding to the extremity of the animal-food theory, a person commenced some years since at Belleville, an outskirt of Paris, the production of poultry out of horse-flesh. There are at present several of these hippophagous farms, which supply a considerable portion of the fowls consumed in the capital of France, but the mode of feeding is kept as secret as possible. It appears, however, that the system answers well, provided the creatures are not kept too long on an exclusively animal diet, in which case they become diseased and totally blind. Some time since an enterprising individual introduced great improvements into this system of raising poultry, and the results have been highly satisfactory. This new establishment occupies nearly thirty acres of land, and is capable of accommodating about a hundred thousand poulets at a time. The poulets are divided into parties, according to their age, and each party has its yard and dormitory, both of which are kept with the utmost possible regard for the health and comfort of the boarders. The food consists almost entirely of horse-flesh, supplied from a slaughter-house adjoining the farm, and belonging to the same proprietor. The blood of the animals is carefully saved, and fetches a good price; the hides go to the tanners; the head and hoofs to the Prussian blue makers; the marrow to the perfumers; the large bones to the button makers; and the refuse is converted into manure. The approximate value of the carcase of a horse in France has recently been stated to be as follows:—Skin, weighing from 50 to 75 lbs., 13 to 18 francs; long hair, from ½d. to ⅓d. per lb., one to three-pence; flesh, from 35 to 45 francs; blood, about 2·50 to 3.50; intestines, 1·60 to 1·80; tendons, 1·20; grease, value from 4 to 30 francs; hoofs and bones, about 2·50; and shoes and nails about 25 to 50 centimes; total, from 60 to 120 francs—£2 8s. to £4 16s. The number of horses slaughtered averages about twenty a day, and the affair is so well organised that the sales pay all expenses, leaving the flesh as clear profit. This last product is boiled in enormous coppers, chopped up as if for sausages, and conveyed to the farm after being seasoned with a small quantity of salt and pepper, which prevents putrefaction and also contributes to the health of the poultry. It is found that the production of eggs is more profitable than the sale of chickens, as under a meat diet the hens lay all the year round, and never exhibit an inclination to set. During last winter this establishment sent 40,000 dozens of eggs per week to market, at about sixpence per dozen. The hens yield as an average about twelve shillings per head per annum, and they lay for four years, at the end of which time they are fattened for three weeks with bruised grain, and sent to market alive. The steam hatching apparatus of the establishment is on a grand scale, furnishing employment for fifty or sixty women. The spare cocks are sent to market, and these amounted last autumn to more than a thousand dozens in three months. The manure is one of the important products of the establishments; it amounts to about 360 cubic mètres a year, and is said to be one of the best fertilizers known, and to be equally adapted to all kinds of crops.

Colonies.

Cotton Cultivation in Queensland. — From the accounts of the severe floods during the month of March,

serious anticipations were formed as to the safety of the cotton crops in this colony, most of the plantations being situated on the alluvial banks of the principal rivers and creeks. As, however, a great variety of land is being operated on by cotton growers, and considerable diversity of opinion has long existed as to what was a suitable character of land for cotton growing, some anxiety has naturally been felt for the reports of the floods and continued wet weather. However, on the whole, cotton has suffered less than most crops, and cotton farms in well-selected localities are quite safe. On several of the plantations cotton-picking has commenced, and although later than usual an average crop is expected. With regard to the quality of the Queensland cotton, it will be superior to any yet exported, great care having been taken in the plantations of best seed; and past experiences have proved that, in the preparation of the fibre for market, where the greatest care is adopted in picking and ginning, that the more remunerative prices have been obtained. Samples of sea island cotton are well got up for the home market, and of superior quality. It is very difficult to estimate the probable export of the season's cotton, though there is good reason to believe that, had storms and floods not occurred, a large quantity would have been exported in April last to the home market.

Canadian Fisheries.—A private letter, dated May 28, says that there is little improvement in the seal fishery. The north-east wind continues, and the coast is still blocked with ice. Some 30 or 40 sealers have arrived in all, bringing about 5,000 seals. The bulk of the fleet are still ice-bound at the northward, and their return is not expected until a change of wind occurs. Business has been generally interfered with by the ice blockade. The same cause which prevented the arrival of foreign vessels prevented the outport fishermen getting into St. John's for supplies, preparatory to proceeding on codfishing voyages. The protracted absence of the Newfoundland sailing fleet, comprising several hundred vessels, manned by many thousand men, has become a source of painful anxiety. Under ordinary circumstances the supplies furnished the sailing vessels should scarcely have lasted their numerous crews half the lengthened period that has elapsed since their departure for the ice fields.

Publications Issued.

Memoirs of the Distinguished Men of Science of Great Britain, Living a.d. 1807–8. By W. Walker, jun., with an Introduction by Robert Hunt, F.R.S. Second edition, revised and enlarged. (*Spon.*) The first edition of this work was intended as a hand-book to a remarkable engraving, by Mr. W. Walker, from a design by John Gilbert, of an assemblage of fifty-one eminent men (astronomers, chemists, men of science, engineers, &c.), grouped in the library of the Royal Institution. The memoirs proved so attractive that the publishers, having made several additions to the list of worthies, have reprinted the volume, with an introduction by Robert Hunt, F.R.S., and it now contains the lives of Watt, Rennie, Telford, Mylne, Jessop, Chapman, Murdock—the first to introduce gas into practical use; Rumford, Huddart, Boulton, Brunel, Watson, Bentham, Maudslev, Dalton, Cavendish, Sir Humphry Davy, Wollaston, Hatchett, Henry, Allen, Howard, Smith—the father of English geology; Crompton—inventor of the spinning mule; Cartwright, Tennant, Ronalds—the first to successfully pass an electric telegraph message through a long distance; Charles Earl Stanhope, Trevithick, Nasmyth, Miller, of Dalswinton, and Symington—the inventors and constructors of the first practical steam-boat; Professor Thompson, of Glasgow, Troughton, Donkin, Congreve, Herschel, Maskelyne, Baily, Frodsham, Leslie, Playfair, Rutherford, Dollond, Brown—the botanist; Gilbert and Banks, the Presidents of the Royal Society at that epoch of time; Captain Kater, celebrated for his pendulum experiments; Dr. Thomas Young, and Jenner—the benefactor of mankind; James Ivory, Dr. Priestly, and Cort—the father of the iron trade.

Notes.

Gift to the South Kensington Museum.—An interesting collection of objects has lately been presented to the South Kensington Museum by the Rev. R. Brooke, of Gateforth Hall, Selby, consisting of numerous objects of the 16th, 17th, and 18th centuries, used and preserved in the families of Brooke and Osbaldistone, which will enrich several of the divisions of the Museum. Amongst the objects thus acquired by the nation are a unique collection of posy rings with sentimental mottoes of the 16th, 17th, and 18th centuries, gold and silver watches, very fine pillow and guipure lace, a series of walking canes, military accoutrements of various kinds, costumes and court dresses (male and female) of the 18th century, a collection of spurs for cock fighting, hoods for hawks, &c., which illustrate bye-gone sports, besides a miscellaneous but interesting and suggestive collection of "knick-knacks," which our great grandfathers and great grandmothers used in their domestic life. Some of these objects, the posy rings and watches, for example, are already exhibited, and others will be gradually shown as they are arranged.

French Academy of Sciences.—A paper was recently read, at the Academy of Moral and Political Science, from Mr. E. Chadwick, C.B., the newly-elected Foreign Associate, on the English law respecting the employment and education of factory children, which attracted considerable attention. The subject is one which has been well discussed in England, but it is almost new to France, and promises to give rise to important considerations. The subject of primary education has received great attention in France, and it must be admitted that the capital deserves great praise for the manner in which it has provided for the instruction of its poorer children; but in the factory districts much remains to be done, and Mr. Chadwick's communication seems not unlikely to furnish the necessary impulse.

A Picture got out of the Fire.—A curious incident occurred the other day with respect to a marine picture, "A View of the Golden Horn and Constantinople," by Gudin. The Comte Aguado purchased it some time since of the artist for 25,000 or 30,000 francs, and the other day, when a fire happened in the connoisseur's apartments, this picture was supposed to have been utterly ruined, and the insurance company, having indemnified the Count, sent it to the auction-room to be sold for whatever it would fetch. Its appearance as an object of vertu created considerable amusement; it was thoroughly blackened, and bore the marks of two foot prints made by the heavy shoes of a fireman, and when Mr. Bruaut, a picture dealer, became the purchaser for the sum of 325 francs, his friends and others said with a smile that they should be glad to hear of his having made a thousand francs by his bargain. M. Bruant took the matter very calmly, thinking perhaps within himself that those who laughed last laughed best, and taking home the picture, he set to work to clean and repair it; and this he has accomplished so well that critical judges declare it to be as good as ever; and it is whispered that Count Aguado is so satisfied with M. Bruaut's work, that the "Golden Horn" is likely to be re-elevated in the gallery from which it was rudely expelled in consideration of a sum of money very little less than that given for it originally. The resuscitation of the work is a fortunate thing for M. Gudin, the artist who has changed his style materially, and certainly has not for many years produced a picture of equal value in general estimation. The fireman's footmark will be always an interesting kind of monogram.

Correspondence.

THE ROYAL ACADEMY.

Sir,—Now that the Commissioners' Report upon the Royal Academy, and their own "Observations" in reply, are in print before the public, and the matter contained therein has formed subject for debate in both houses of the legislature, it is well that those interested in the Arts generally should know something of the wants, demands, and concessions of its professors and the public; and in no journal would a few remarks be more *apropos* than in that of the Society of Arts—a venerable Society—that can claim the paternity of many. The first Exhibition of Paintings, which led to the formation of the Royal Academy, was held in its Rooms, where the most distinguished members of the Royal Academy in youth have been rewarded—and where its veteran professors—Etty, Mulready, and others—have seen their works collected—where art objects have been discussed, and laws for their protection argued and consolidated. With regard to the documents—"The Report of the Commissioners" and "The Observations of Royal Academy" in reply, the artists, having the two before them, would, it is thought, be informed on all points that so deeply concern their welfare and the interests of Art; yet this is not the case, but the artists having —at least the mass outside the academy—taken much trouble to master the details of the two documents; it is now desirable that their views should be declared, and that the subject should be ventilated. This is the more necessary in order that practical and business ideas may be united with theory in the foundation and consolidation of a National Academy, that should teach, develop, and honour the Art power of the country, and encourage it to shed its enlightening influence upon everything, as it did in the middle ages, when an artist was not alone a painter (working for an annual show), but a sculptor, architect, and engineer, and often a scholar, poet, and musician. As a body, the artists are grateful for the efforts of the Royal Academy Commission—though, perhaps, they may be pardoned for viewing the matter more as a personal affair, that will do them greater individual good than develop the art they ought to love for its own sake. Hence, perhaps, the greatest charm for the mass of artists is the proposed extended space for the exhibition of their intellectual wares. Instead of 1,062 works, as at present, it is hoped room will be found for the exhibition of many thousands—including large experimental works, worthy of a great educational establishment, that seeks not alone to please the eye, but to instruct the public to appreciate art and processes of art applied to things in general; in continental exhibitions we find a very wide range taken, and all classes of works fairly displayed, until art approaches the confines of science—some few thinking it would be well to display all works sent, as at the Paris *Salon* this year. There were shown 3,459 works, 379 gracing a separate chamber, called "the Purgatory," being of (presumed) inferior quality. Sculpture and architecture should be fairly displayed even to the practical. The sculpture, if shown in connexion with painting, would require the most judicious arrangements. The associate class is the next great subject that interests the mass of artists at present unconnected with the academy, a limited number having great charms for a few who aspire to a seat and influence in its councils. Now there is no objection to this, provided there can be a large associate class from which to draw the fifty representative associates to sit in council with the fifty academicians. It would be a lamentable thing to think that there should be but one hundred artists in the United Kingdom worthy to be members of a national academy and bear weight in its balance. This the Academy has itself felt whilst proposing that the associate class should be unlimited—a very wise and judicious proposal if they grant some of them a *bonâ fide* influence in the councils that are to guide the institution. The wide base advocated I have heard objected to, as throwing greater power into the Academy, a thing to some extent true, though not to be dreaded, if the scales are equally adjusted. The fact is, the great world of art and artists ought to be connected with it, though they may never exhibit upon its walls or even elsewhere. The greatest freedom should exist upon this point, and the Academy be glad of the company of all men of talent who can aid the common weal by their theory or their practice. A great mural painter, who does not produce easel pictures, or a sculptor always engaged on great public works, may not care for exhibitions, and it would be unjust to compel him to do so; the wall painters may find space enough in public halls, and the sculptors in the streets. Regarding the "lay element," the artists, with a very few exceptions, have a great dislike to it, though hardly with reason, for they fail to show why a few distinguished noblemen and gentlemen united with them in a common cause, would augur ill, though the presence of laymen in practical matters of art would be of little use; yet, if nominated on the part of the Crown to act as trustees, men of influence and high position could play a very useful part, and add dignity to the Academy. The case of "Art-Workmen" in connection with the Academy I find pretty much as stated in a letter to the *Journal* of January 8, 1864; artists thinking that whilst the Royal Academy should do everything to foster and encourage *creative* art, in its widest sense, to decorate and beautify everything, yet when that creative power passes into the hands of a translator—into another tongue—it appeals to technicalities hardly within their province, being a department of art so connected with the technicalities of science, and that it cannot be in better hands than those of the Society of Arts, who, by their prizes to art-workmen, are doing infinite good. On the rival claims of locale—Trafalgar-square or Burlington-house —opinion is divided; though I think the balance is in favour of the former, particularly as a place for an annual exhibition, and central for the schools. Artists of established repute, of course, look upon the exhibition as the soul of the Academy, and the schools of minor importance; but certain it is the institution becomes rich by the one and less rich by the other. As the site for a dignified educational establishment, Burlington-house is most desirable and quiet; it is possible that the frontage may not be equal to Trafalgar-square, though the position in Piccadilly is preferable for visitors, not a tithe coming from the east. To be at the junction of Regent-street, Bond-street, and Piccadilly would certainly be a grand thing for art in the metropolis, and its patrons also. As to many minor proposals of the Royal Commission and the Royal Academy, they find much favour with the world of art, though the "Report of the Commission" is better known than "Observations of the Academy," the former having been before the public some months, whilst the latter has not long been published. It is most desirable that both documents should be collated and consolidated, the claims of artists and the public duly considered, that the Academy may enter upon a new lease as lasting as the old one at its foundation some century ago.—I am, &c., John Leighton.

The following memorial has been sent to Earl Stanhope, and was mentioned in the debate in the House of Lords on Friday, June 24th. I forward it to show the feeling of artists on this subject:—

We, the undersigned artists, having carefully considered that portion of the Observations of the Royal Academy which relates to the mode of election and to the position of the future associate class, are of opinion,

That the Royal Academy scheme is unsuited to the wants of the profession and incompatible with a liberal constitution.

In support of which opinion, we beg to offer the following

Remarks.

The Royal Academy Commissioners propose that the number of Associates of the Royal Academy be increased at once to 50, with power at any time hereafter to fix a larger number with the assent of the Crown, and "these 50, conjointly with the Academicians, should form the General Assembly."

The counter proposal of the Academicians, as expressed in their "Observations upon the Report of the Commissioners," is,

That the new class of Associates should consist of an indefinite number of professional artists. That the right of nomination for filling up vacancies, both in their own and in the upper class, shall be given them, but that they shall be unrepresented in the General Assembly. Had this right of nomination been understood by the Academy in the ordinary acceptance of the term; in other words, had the Associate class been the nominating and the Academicians the electing body, we should not (though greatly preferring the scheme of the Commissioners) have taken exception to the proposal; but the authors of the Observations explain that the mode of nominating the Associates of the new class is as follows:—

"The secretary shall at an appointed time send a printed form of nomination to each Academician and Associate, and shall invite him to insert in such printed form the names of the artists he may desire to propose as candidates for the rank of Associate, according to the number of elections previously recommended.

"The nomination paper, so filled up and signed by the member, shall be returned to the secretary within a specified time."

From this it appears that the Academicians nominate as well as the Associates, and as each member has to sign his nomination paper, those sent in by the Associates may be utterly disregarded, and thus the so-called right of nomination reduced to a mere power of expressing an opinion.

That this is a correct view of the question appears from the following paragraph:—

"The right of nomination, which we propose to distinguish from personal voting in elections, is an important privilege as such, but its great utility would be to put the Academicians in possession of opinions which might sometimes differ from their own."

We cannot refrain from remarking that the right of expressing an opinion differing from that of the Academicians does not, in our mind, constitute an important privilege.

We cannot agree with the authors of the Observations in thinking that, under the system recommended by the Royal Academy Commission, the Associates who might be candidates for the higher rank would be in a less independent position than the Associates are at present.

We can, at any rate, answer for ourselves, that should we ever be called upon, as Associates, to take part in the General Assembly, we shall be both ready and willing to express our independent opinion. We trust that the time has gone by when the fear of giving umbrage to the older members would embarrass the candidate for academic honours; and should any such fear still linger amongst the more timid members of the profession, we think that nothing would tend more to extinguish it than the institution of a General Assembly similar to the one recommended by the Commissioners.

We agree with the Commissioners in thinking that "three hanging committees should be annually nominated by the Council and elected by the General Assembly; and that each committee should consist of two Academicians and one Associate." We cannot conceive how this Associate would be placed in a wrong position. He would not be expected to act as an uncompromising and partial advocate of his class, but as a fair representative of the younger and rising school.

The Academicians remark very justly that "In a constituency of artists there are, or should be, no rival interests;" and yet their whole argument is founded on the assumption that such rival interests do exist, and that the rivalry must be extinguished by keeping the Associate class down. It seems to us utterly impossible that any question could arise on which the whole of the Academicians would take one side and the whole of the Associates the other; but, supposing such a contigency possible, it might be provided against, by limiting the number of Associates who would sit in the General Assembly to those who were habitual exhibitors.

Neither the Commissioners nor the Academy offer any privilege to the Associates with respect to the placing of their works in the exhibition.

We are nevertheless of opinion that, so long as such a privilege is retained by the Academicians, it ought to be extended (though perhaps in a minor degree) to the Associates. At the same time, we freely acknowledge that, could this privilege be altogether abolished for all classes, and the exhibited works placed according to merit alone, the interests of Art would be promoted thereby, and the standard of the annual exhibition greatly raised.

[Here follow the signatures.]

MEETINGS FOR THE ENSUING WEEK.

Tues. ...Zoological, 4.
Wed. ...Literary Fund, 3.

Patents.

From Commissioners of Patents Journal, July 1st.

Grants of Provisional Protection.

Chains and chain cables—1261—G. Homfray.
Clay, &c., machinery for treating—1417—J. A. Wade.
Embossing in coloured relief—1462—R. Kendrick.
Fabrics, printing—1413—W. Clark.
Fire-arms, breech-loading—1395—W. J. Matthews.
Jute, treatment of—563—T. Gray.
Looms—1448—R. Hall.
Oils, refining—1484—J. A. Pols.
Ordnance, &c.—1431—P. M. Parsons.
Rags, treating—1453—G. Rydill.
Sapota mulleri, extracting juice of—819—S. W. Silver.
Sewing machines, &c., self-acting motion for—1298—W. Passmore.
Soap, manufacture of—1443—C. H. Snell.

Inventions with Complete Specifications Filed.

Ores and metals, smelting—1564—G. Haseltine.
Paper bags, machine for manufacturing—1603—W. E. Gedge.

Patents Sealed.

21. M. Bayliss.
30. J. J. Hays.
37. E. Fairburn.
39. R. A. Brooman.
109. J. E. Baker.
127. E. Lord.
925. F. A. Gatty.

From Commissioners of Patents Journal, July 5th.

Patents Sealed.

56. P. McLaurin.
59. W. Brookes.
64. J. Coppard.
67. W. E. Gedge.
69. J. N. Garrod.
76. J. Coates.
86. L. E. C. Martin.
88. C. Askew.
89. W. Welch.
90. C. Bartholomew.
92. P. McIntyre.
94. G. Wilkins.
95. G. W. Hart.
97. M. A. Dietz.
106. N. Thompson.
116. C. Reynolds and J. Barrington.
140. G. Jenner.
168. J. H. Johnson.
186. J. Shaw.
187. J. Shaw.
226. J. Zacherl.
275. F. E. Martineau.
880. C. A. Ferguson, jun., and T. Ferguson.

Patents on which the Stamp Duty of £50 has been Paid.

1654. H. J. Rouse.
1674. L. H. Spence.
1701. W. H. Ludford.
1750. J. Farron.
1695. P. Spence.

Patent on which the Stamp Duty of £100 has been paid.

1815. S. Nye.

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Proceedings of the Society.

CANTOR LECTURES.

"ON CHEMISTRY APPLIED TO THE ARTS." BY DR. F. CRACE CALVERT, F.R.S., F.C.S.

LECTURE II.

DELIVERED ON THURSDAY EVENING, APRIL 7TH, 1864.

GELATINE, GLUE, BONE-SIZE, CHONDRINE, their preparation, chemical properties, nutritive value, and application to arts and manufactures. Artificial tortoiseshell. *Isinglass*, its adulterations and adaptations to the clarification of fluids. *Skins* and the art of tanning.

As the syllabus will show you, I intend to draw your attention, especially in this lecture, to gelatinous substances, as well as to the art of tanning. There are four distinct gelatinous substances obtained on a commercial scale from animal tissues and bones, viz.,—*Osseine*, which I mentioned in my last lecture, *Gelatine*, *Chondrine*, and *Isinglass*.

Osseine, as already stated, is the animal matter existing in bones, and no doubt it is the same substance which also exists in skins, both during life and when recently removed from the animal. It is characterised by its insolubility, its inability to combine with tannin, and lastly, the facility with which it undergoes a molecular change, and becomes converted into gelatine, slowly, when boiled with water at 212°, rapidly, when boiled under pressure at a higher temperature, and very gradually under the influence of putrefaction.

Gelatine is a solid semi-transparent substance, which absorbs water in large quantities (40 per cent.), becoming thereby transparent. It is very slightly soluble in cold water, but very soluble in boiling water; and this solution has the characteristic property of forming a jelly on cooling. So powerful is gelatine in soldifying water, that one part of gelatine will form a jelly with 100 parts of water. It has been observed that gelatine loses this valuable property if boiled for a long time at ordinary pressure, or if carried to a temperature above 223° F. Before examining the interesting action of acids upon gelatine, allow me to mention that whilst solid gelatine resists putrefaction for a long time, its solutions have a tendency to putrefy rapidly, but I have the pleasure to inform you that a few drops of a substance called carbolic acid will prevent putrefaction for a long period. Gelatine dissolves readily in acetic acid, of moderate strength, or vinegar, and this solution, which is used as glue, has the useful property of remaining fluid and sound for some time. But a Frenchman, named Demoulin, has introduced of late years in Paris a solution of glue which is superior to the above and to that in common use, because it does away with the trouble of constantly heating the glue-pot. His process consists in melting one pound of best glue in one pound of water, and adding gradually to the two one ounce of nitric acid of sp. gr. 1·36, heating the whole for a short time, when the fluid glue is prepared. The action of concentrated nitric acid on gelatine is most violent, giving rise to several compounds, amongst which may be cited oxalic acid. The action of sulphuric acid on gelatine is important in a scientific point of view, as an alkaloid called leucine is produced, as well as a sweet substance, called glycocolle, or sugar of gelatine. Gelatine is distinguished from other organic substances by the following chemical reactions:—it gives a white precipitate with alcohol, also with chlorine, none with gallic acid, but one with tannin, or tannic acid. The properties of this precipitate are most important to us, as it is on the formation of it in hides that we ascribe their conversion into leather. The relative proportion of these two substances (gelatine and tannin) in the precipitate varies with the respective proportions brought in contact, but precipitates containing as much as 46 per cent. of tannin have been examined. It is insoluble in water, and presents the invaluable character of not entering into putrefaction. Beautiful fancy ornaments have recently been introduced in Paris by M. Pinson, called artificial tortoiseshell, which he obtains by melting, at a moderate temperature, gelatine with a small amount of metallic salts, running the whole into moulds, staining the mass with hydro-sulphate of ammonia, so as to produce an imitation of the grain of tortoiseshell. The objects so produced are then polished and ready for sale. Before entering on the manufacture of various qualities of gelatine, I should wish to state that there can be no doubt, from the researches of Magendie, as well as from the Report of the Commission appointed by the Netherlands Academy of Sciences, that gelatine as food possesses no nutritive value whatever. Allow me now to give you a rapid outline of the methods followed in the manufacture of various qualities of gelatine. The first quality of gelatine is prepared by taking the clippings, scrapings, and fleshings from the tanyard, treating them with lime water or alkali, to remove any smell and certain impurities. They are then well washed and left in contact for a day or two with a solution of sulphurous acid. They are then placed in a suitable apparatus with water, and heated, when the osseine is converted into gelatine. This is run into a second vessel, and a little alum added, to throw down any impurities that may be in suspension. The liquor is now ready to be run into another pan, where it is concentrated to the necessary consistency, so as to become solid, when it is run into wooden moulds. Eighteen hours afterwards the gelatine is turned out of these moulds on to a wet slab, where it is cut into slices by means of a copper wire; these slices are placed on wire gauze frames, and left in a drying shed until they are perfectly dry and ready for the requirements of trade. The second quality of gelatine is prepared by placing bones in large cylinders, and allowing high-pressure steam to arrive at the bottom of the cylinder, which rapidly converts the osseine of the bones into gelatine, and the removal of this is facilitated by allowing a stream of hot water to enter the upper part of the cylinder. The solution of gelatine thus obtained is evaporated, and is usually employed for the preparation of glue. A third quality is prepared by treating bones with hydrochloric acid (as referred to in my first lecture), and submitting the osseine thus obtained to the action of steam. Lastly, a fourth quality of gelatine, called bone-size, is manu-

factured by boiling more or less decayed bones, as imported from South America and elsewhere, the flesh of dead animals, &c., and concentrating the solution to the consistency required for the various applications it receives in commerce. [The lecturer then described the mode of obtaining the beautiful thin coloured sheets of gelatine used in photography and other fancy purposes, and also the characteristics which distinguished good from bad glues.]

Chondrine, or cartilage gelatine, first noticed by Messrs. Müller and Vögel, Jun., is interesting as possessing qualities, not only different from those of gelatine, but such as injure the quality of the latter when mixed with it. In fact it gives precipitates with acetic acid, alum, persulphate of iron and other salts; and as gelatine is often used in connexion with these substances, it is easy to foresee how these precipitates may interfere with its application. On the other hand, the quality possessed by this peculiar gelatine, may, I think, render it serviceable in the art of calico printing, for fixing colours, or as a substitute for albumen or lactarine. Thus, the solution of chondrine and acetic acid may be mixed with any of the new tar colours, and the whole printed, allowed to dry, and steamed; the acetic acid will be driven off, leaving the colour fixed by the chondrine on the fabric. Chondrine is prepared by submitting to the action of heat and water the cartilaginous tissue of animals or the bones of young animals.

Isinglass is obtained from the air-bag or swimming-bladder of several kinds of fish, especially those of the sturgeon tribe, and, although imported from various parts of the world, the principal supplies are from Russia, from whence the best qualities come, which bear the names of Beluga, Volga, or Caspian Sea leaf. Brazil, New York, the East Indies, and Hudson's Bay, also supply various qualities of this valuable substance. It also reaches this country in different states, viz., in leaf and in honeycomb, that is, the bag is cut open, cleaned, and dried; and the quality called snow-bleached is enhanced in value by having been buried in the snow on the banks of the Volga for a long period, by which the isinglass is whitened. Pipes, purses, and lumps are bags which have been cleared but not opened; and a quality called ribbons is made by rolling the bag and cutting it into strips before shipping it to this country.

I shall now endeavour to explain to you how the beautiful preparations before you, for which I am indebted to the kindness of Mr. James Vickers, are obtained. The leaf bladder is first softened in water, and rolled out, under high pressure, into thin leaves, which may extend to several feet long; these in their turn are drawn under a number of revolving knives, making 1,000 revolutions per minute, by which 6,000 of the well-known fine threads are produced in every minute. This quality is chiefly used for culinary purposes. For commercial uses the purses or lumps above mentioned are chiefly employed. These are soaked in water for two or three days, cut open, certain useless parts removed, further softened, rolled, and cut into various dimensions, according to the requirements of trade, their chief use being the clarification of beer and other alcoholic fluids, for which gelatine cannot be employed, because it dissolves in water whilst isinglass merely swells. The result is that the highly-swollen and extended mass, when poured into beer, wine, or other alcoholic fluids, is on the one hand contracted by their alcohol, and on the other hand it combines with their tannin, forming an insoluble precipitate, which, as it falls through the liquor, carries with it the impurities in suspension, and thus clarifies the fluid. As isinglass is very slow in swelling out in water, brewers employ an acid fluid for the purpose, but, strange to say, instead of using pure acetic acid, many of them take sour beer, and thus run the great risk of spoiling their sound beer. I have known instances of great losses occurring in this way, acetous fermentation having been thus spread through an entire brewery during the summer months. As a large quantity of gelatine, cut into shreds, in imitation of isinglass, is sold at the present day, it may be useful to know that detection is very easy, by the following method:—Place a small quantity in hot water, in which gelatine will readily dissolve, whilst isinglass will do so very slowly. I cannot conclude the examination of this interesting class of substances without drawing your attention to the fact that osseine, gelatine, chondrine, and isinglass present marked differences in their textures and general properties, although their chemical compositions may be considered identical, thus:—

	Osseine.	Gelatine.	Chondrine.	Isinglass.
Carbon	50·4	50·0	50·61	50·56
Hydrogen ...	6·5	6·5	6·58	6·90
Nitrogen ...	16·9	17·5	15·44	17·79
Oxygen	26·2	26·0	27·37	24·75

Esculent Nests.—I must not omit to mention, in connection with this interesting class of substances, these curious gelatinous products, which are not only considered great delicacies in China, India, but even in Europe, where they realize from £3 to £7 per pound; considerable quantities are imported into England. It has long been a disputed question what is the chemical nature of the substance composing these nests, which are the product of a peculiar kind of swallow; but Mr. Payen, by his recent researches, has left no doubt in the minds of chemists that it is an animal, not a vegetable matter. In fact, it is a peculiar mucous substance, secreted by the bird, and composed of carbon, hydrogen, oxygen, nitrogen, and sulphur. Further, it is insoluble in cold water, but soluble in boiling, and differs from gelatine and isinglass in that it does not gelatinize as it cools.

Skins.—Skin consists of two principal parts, one a mere film, called the epidermis, and the other constituting the bulk of the skin, and called the dermis. There are also found in skin a large quantity of blood-vessels, and a small quantity of pigment cells, which hold the colouring matter. Further, the skin contains a small amount of nerves and a number of glands, among which may be cited the sebaceous glands or follicles, which are intended to secrete the unctuous matter constantly accumulating upon the skin, and keeping it soft and pliable; then there are the perspiratory glands, which play a most important part in the physiological construction of the skin. These are so numerous that Mr. Erasmus Wilson has calculated that there are 3,528 of them in a single square inch of human skin, so that in an ordinary sized body there are no less than 2,300,000 of these pores. But still the most important part of the hide for us is that called the "dermis." The skins of animals are commercially divided into three distinct classes. The hide is the name given to the skin of full-grown animals, such as oxen, horses, and buffaloes; and these are further sub-divided into fresh hides, that is to say, those which are obtained from animals slaughtered in this country; dry hides, that is, hides which have been dried in the sun, and which are principally imported from South America; dry salted hides, principally from the Brazils, where they are salted and then dried in the sun; and salted hides, which are preserved in Monte Video and Buenos Ayres by salting them, and which are shipped, embedded in salt, to this country. The composition of a fresh hide may be considered to be asfollows:—

Real skin	32·53
Albumen	1·54
Animal matters soluble in alcohol... ...	0·83
Animal matters soluble in cold water... ...	7·60
Water	57·50
	100·00

A second class of hides is that called kips, which are skins flayed from the same kinds of animal as the foregoing, only when young. Thirdly, the term skin is applied to those of small animals, such as the sheep, goat, seal, &c.

I will now endeavour to give you an idea of the prepara-

tion which hides undergo to fit them for the art of tanning. These operations are four. The first consists in washing off the dirt from the hide, softening it, if a dried one, or removing the salt, if salted. The second has for its object the removal of the hair, which is effected by two or three different methods. The most usual plan is to place the hides in large vats, containing a weak milk of lime, for two or three weeks, care being taken to remove and replace them every other day, after which time the hair is sufficiently loosened to be removed. A second plan consists in piling up the hides, allowing them to enter slightly into a state of putrefaction, and then placing them in weak milk of lime, so as to complete not only the loosening of the hair but also the swelling of the hide, for lime also possesses that property. Another process, which is called the American plan, is to hang the hides in pits for two or three weeks, keeping them at a temperature of 60° and constantly wet, when the hair can be easily removed. Weak alkalies are sometimes substituted with great advantage for lime in the above processes, and this plan is certainly the best, as it does not leave in the hide any mineral residue, as is the case with lime, either in the form of an insoluble soap of lime or of carbonate, both of which are highly objectionable in the subsequent process of tanning, as they act on the tannic acid of the tan, facilitating its oxidation, and thereby rendering it useless. Depilation of hides is sometimes effected by the employment of weak organic acids; thus the Calmuck Tartars have used from time immemorial sour milk for that purpose. In some parts of France, Belgium, and Germany, the unhairing of the skins is also effected by an acid fluid, produced by the fermentation of barley meal, which gives rise to acetic and lactic acids. To carry out this process generally speaking five vats are used. In the first the hides are cleaned; in the second they are softened, and the hair and epidermis prepared for depilation; and the third, fourth, and fifth are used to swell and give body to the hide. This operation, which is called white-dressing, does not work so well as lime for heavy hides, as it swells them to such an extent as to render them unfit to prepare compact leather. When the hair can be easily pulled off, the hides are placed on a convex board, called a beam, and scraped with a double-handed concave knife, which not only removes the hair, but a large amount of fatty lime-soap and other impurities from the hides. The third operation consists in fleshing the hides, by shaving off all useless flesh, fat, and other matter by means of a sharp tool. The fourth operation is called swelling or raising the hide, the purpose of which is the following:—First, the removal of any lime or alkali which may remain in the hide; and secondly, to swell or open the pores of the hide, so as to render them better adapted to absorb the tannic acid of the tanning liquors. This is effected by dipping the hides in weak spent tanning liquors, or liquors which have lost the tannic acid, but which contain more or less of gallic acid, for not only do all tanning matters contain gallic acid, but its proportion is greatly increased during the operation of tanning, by a process of fermentation which goes on during that operation, and which converts tannic acid into gallic acid and a peculiar sugar.

The Tanning of Hides.—The old process of tanning consisted in placing layers of wet tan and of hides alternately, and after two or three months removing the whole from the pit and replacing the old by fresh tan. These operations were repeated until the hides were tanned, which took from eighteen months to two years, owing to the difficulty of the tannic acid reaching the interior of the hide. Of late years the process of tanning has been greatly shortened by treating the bark with water, and steeping the hides in the liquor, first weak and afterwards strong. By this means good leather can be obtained in the space of eight or ten months. More rapid tanning, but probably giving inferior leather, is effected by employing, in conjunction with, or as a substitute for, bark, a decoction of dividivi, valonia, myrobalan, catechu or terra japonica, gambia, &c. Many efforts have been made of late years to apply the laws of hydraulics, as well as several physical and physiological principles discovered by eminent philosophers, with the view of shortening the period of tanning, but as I believe that none of them have received the general sanction of the trade, I shall confine myself to giving you an idea of the most successful ones. The first attempt to accelerate the process of tanning consisted in forcing the tanning fluids into the substance of the hide by means of hydraulic pressure. Mr. Spilbury, in 1831, employed a process which consisted in making the hides into sacks, and plunging them into a tanning liquor, and as the fluid percolated through the skin into the interior of the bag the air was allowed to escape. By this means a certain amount of time was saved in bringing the tanning liquor in contact with the various parts of the skin. Mr. Drake soon followed in the same direction, his plan being to sew hides together, forming bags, which he filled with a solution of tan; and to prevent the distention of the skins by the pressure of the liquid within, they were supported in suitable frames; as the pores became gradually filled with tannin, artificial heat was applied to increase the percolation of the fluid. Messrs. Chaplin and Cox's process is also very similar to the above, the difference being that the tanning fluid is placed in a reservoir, and allowed to flow into the bag of hides through a pipe, the fluid being thus employed at pressures varying according to the height of the reservoir. The bag of hides is at the same time plunged into a solution of tannin to prevent excessive distention. Messrs. Knowles and Dewsbury have recourse to another principle to compel the percolation of the tanning liquor through the hide. To effect their purpose they cover vessels with hides, so as to form air-tight enclosures, and, having placed the tanning fluid they employ on the hides, the vessels are exhausted of air, and atmospheric pressure then forces the fluid through the skins into the vessels below. Mr. Turnbull's process, being an imitation of that used for tanning Morocco leather, need not be described. Attempts have been made from time to time to mineralize hides, that is to say, to substitute for tanning, mineral salts, as will be described in my next lecture, when speaking of the art of tawing skins. The processes which have attracted most notice in this branch of the art of preparing leather are those of Messrs. D'Arcet and Ashton, M. Bordier, and M. Cavalier. M. Bordier's plan is that of dipping hides in a solution of sesqui-sulphate of iron, when the animal matters of the hide gradually combine with a basic sesqui-sulphate of iron, rendering the hide imputrescible, and converting it into leather. M. Cavalier's method is to dip hides first into a solution of protosulphate of iron, and then into one containing alum and bichromate of potash. A chemical action ensues by which the protosulphate of iron is converted into a persulphate, combining with the animal matter, and by its preservative action, together with that of some of the alum, the hide is converted into leather. I think, however, that I shall be able to satisfy you, from the results of many examinations of leather and hides which I have made, that there are good and sufficient reasons why most of these processes have necessarily failed. Inventors have been led to believe, by the statements of many eminent physiologists (as can be proved by reading some of the most recent works on that science), that skin is composed of blood-vessels, glands, &c., plus gelatine, and that if by any mechanical contrivance the tanning liquor could be brought into contact with this gelatine, the leather would be tanned; and many ingenious schemes have been devised, and much money expended to obtain that result. The fact, however, is that there is no gelatine in skin, for if there were, when hides were placed in water, the gelatine would be dissolved and washed away. But what is supposed to be gelatine in the hides is in reality the isomeric substance called osseine

or one greatly resembling it. The great discovery to be made in the art of tanning, therefore, is that of a chemical or fermentative process, by which the isomeric change (that of the osseine into gelatine) may be rapidly produced, instead of by the slow putrefactive process which occurs in the old method of tanning. Further, I would observe that to convert a hide into leather it is not sufficient that the whole of its animal matter be combined with tannin, for the leather thus obtained would present two great defects; 1st, the hide would not have increased in weight, and the tanner's profits therefore would suffer; 2ndly, the leather would be so porous as to be useless for many of the purposes for which leather is required. The reason of this is, that when, after a period of several months, the osseine has been converted into gelatine, and this has become thoroughly combined with tannin, a second series of reactions is necessary to render the leather more solid and less permeable to water, and to increase materially its weight. These reactions constitute what is called feeding the hide, and are brought about by leaving it to steep in more concentrated tanning liquor for a considerable period; and this necessary process, beneficial to the wearer as well as to the producer, appears to me to be that which offers the greatest impediment in the way of shortening the period of tanning. The hides as they leave the tanning vat require several operations before they are ready to be used for soles, or to be curried for various commercial purposes. They are first slightly washed and placed in a shed to partially dry, and are then rubbed with a brush and rough stone on the face of the leather, or hair side, to remove any loose tanning material that may remain on the surface; but this rubbing is not applied to the back, as buyers attach great importance to the peculiar appearance called the bloom, which enables them to judge of the goodness of the tanning. The tanned hides are again slightly dried, and oiled on the face, and then submitted to the pressure of a roller passed over the surface, which has the effect of rendering the leather more flexible and the surface perfectly uniform. These operations are repeated two or three times, when the leather is ready for soles. Before the tanned hides intended for shoe-soles are considered fit for that purpose, they must be slightly compressed and softened, so as to again diminish their permeability to water. This was formerly effected by beating with a hammer called the mace, but of late years this slow process has been superseded by compressing machines; and I believe those most appreciated in the trade were invented by Messrs. Cox and Welsh, and Messrs. Iran and Schloss.

Proceedings of Institutions.

Hyde Mechanics' Institution.—The twelfth annual report for last year says that during the past year the Institution has not only maintained, but advanced its position, notwithstanding the almost unexampled trade depression. The Directors speak of the irreparable loss which the Institution has sustained by the death of its founder and munificent patron, the late Benjamin Goodfellow, Esq. The number of members was:—Honorary, 16; annual, 37; ladies, annual, 7; of quarterly and weekly members, the average was about 150. The library has been removed to the ground floor, in order to facilitate the exchange of books, and 79 works have been added during the past year. Besides new books, there has been a large contribution of new and valuable works from the Hyde Book Club, connected with the Institution. The room lately occupied as the library has been adapted as the reading room, and some improvements have been effected. The Directors, hoping to increase the usefulness of the news room, arranged with the General Electric Telegraph Company to furnish telegrams; but the supply has been so intermittent and unsatisfactory as not to be of benefit to the Institution. During the past year the evening classes exhibit a nearly four-fold increase in attendance and receipts over the previous year. An interesting female class has been established. It began with the attendance of the monitresses from the educational department of the Hyde Relief Board's Sewing School, and the progress they made during the few months they attended was considered satisfactory, and induced the hon. secretary of the sewing school, Charles Hibbert, Esq., to distribute several handsome book prizes to the most proficient. The subjects taught were:—reading, English grammar, arithmetic, writing, geography, English history, and household accounts. The visiting agent of the Lancashire and Cheshire Association paid a visit to the Institution, and, having made an examination of the pupils, he expressed his gratification at their attainments. The attendances at the lectures have been good, and the general results satisfactory. A dahlia show was held in September. Concerts and a theatrical performance by the gentlemen amateurs of Manchester were given with success. Besides the evening classes for elementary instruction, it has been arranged to open, in one of the unused rooms of the building, a middle class boys' day school, with a view to supply a felt educational want; and the school, if successful, will prove a small auxiliary to the funds of the Institution. The balance sheet shows an expenditure of £278 11s., and the balance due to treasurer is £6 8s. 2½d., having been reduced from £39 15s. 11d. This result has been brought about principally by the donations received for use of the lecture hall, and other parts of the building. The receipts from the evening classes have increased from £3 19s. 10d. to £14 4s. 4½d. during the year. The directors suggest to their successors to seek the further development of the evening classes, by adding new subjects of instruction, and also by seeking to increase the attendance at those already in existence; also to make some special effort to secure a much larger number of the operative class, so as to make the Institution more really a Mechanics' Institution than it is at present. A movement is springing up in the country which the next directorate may fall in with; to provide a room (where working men may attend in their working dress) as attractive and cosy as possible; where, besides being able to read suitable newspapers, they may enjoy friendly conversation, or hear a song, or recitation. The room should be provided (says the report), with piano, bagatelle table, and various games, as backgammon, chess, and draughts, &c. Here, as in a superior kind of free-and-easy, the working men would have access to society, amusement, and instruction; and if, in addition to occasional attendance at the club-room, the younger members could be induced to take up some subject of study, and systematically pursue it, the usefulness of the Institution would be increased.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Thirty-fourth Meeting of the British Association for the Advancement of Science will commence in Bath on Wednesday, the 14th of September, 1864, under the Presidency of Sir Charles Lyell, M.A., LL.D., D.C.L., F.R.S., and the following are the arrangements for the meeting:—

The General Committee will meet on Wednesday, the 14th of September, at 1 p.m., for the election of sectional officers, and the despatch of business usually brought before that body. On this occasion there will be presented the report of the Council, embodying their proceedings during the past year. The General Committee will meet afterwards by adjournment. The first general meeting will be held on Wednesday, the 14th of September, at 8 p.m., when the President will deliver an address; the concluding meeting on Wednesday, the 21st of September, at 3 p.m., when the Association will be adjourned to

its next place of meeting. At two evening meetings, which will take place at 8 p.m., discourses on certain branches of science will be delivered. There will also be other evening meetings, at which opportunity will be afforded for general conversation among the members. The Committees of Sections will meet daily, from Thursday, the 15th of September, to Wednesday, the 21st of September, inclusive, at 10 a.m. precisely. The Sections will meet daily, from Thursday, the 15th of September, to Tuesday, the 20th of September, inclusive, at 11 a.m. precisely. Reports on the progress of science, and of researches entrusted to individuals and committees, and other communications intended for presentation to the Sections, are expected to be forwarded in letters addressed to the Assistant-General Secretary, at Bath, previously to the meeting, accompanied by a statement whether the author will be present, and on what day, so that the business of the Sections may be satisfactorily arranged. The reports complete, and concise abstracts of other communications, are to be delivered to the Secretaries of the Sections before which they are read, previously to the close of the meeting, for publication in the Transactions. As the reports on Science may be interesting to more Sections than the one which originally called for them, it is desirable that the authors should be prepared to furnish the means of reading them in any other Section at the request of the President and Secretaries of that Section. The following are the titles of the Sections to which communications may be presented:—Section A. Mathematics and Physics. B. Chemistry and Mineralogy, including their applications to Agriculture and the Arts. C. Geology. D. Zoology and Botany, including Physiology. Sub-Section D. E. Geography and Ethnology. F. Economic Science and Statistics. G. Mechanical Science.

At the first meeting of the General Committee it will be proposed by Dr. Hunt, "That Section E. shall include Geography, Ethnology, and Anthropology." An Index to the volumes of Reports of the British Association, from 1831 to 1860, is printed, and will be issued to those members who have subscribed for it, at 12s., carriage included.

EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

ARITHMETIC.

THREE HOURS ALLOWED.

No marks will be allowed for answers where the working is not shown.

1. Find by practice, using only one aliquot part, the value of 537 articles at £9 17s. 6d.
2. In payment of the rent of a field of 10 acres, 2 roods, 16 poles, at £1 19s. 5d. per acre, I received 6 cwt. 3 qrs. 19 lbs. of sugar, worth £3 1s. 7d. per cwt., how much money must I return? *Work by Practice.*
3. If it take 12½ yards of cloth to make 5 coats, and 2½ yards to make 2 waistcoats, how many yards will it require to make 7 coats and 8 waistcoats?
4. How much will ⅝ of 78⅝ yards amount to at 5s. 3d. for ⅘ of 1¾ yards?
5. What fraction of a guinea and a half added to £3 16s. 9d. will amount to £4.
6. A merchant owes a certain sum; he pays severally £25 6fl., £36 9fl. 6c., £27 8fl., £38 5fl. 8c. 3 mils, and £46 7c. 2 mils, and receives back £5 1c. 5 mils; required the amount of his debt.
7. The smaller of two sums is £74 1fl. 8c. 5 mils; their difference is £2 9fl. 6c. 3 mils; express the larger amount in the common currency.
8. If a person pay £12 3s. 9d. for income-tax, when the tax is 7d. in the pound, what extra sum will he pay when the tax is 16d. in the pound?
9. If 18 per cent. of an army be killed in battle, and 14 per cent. of the remainder desert, and 21,156 men be left, what was the original strength of the army?
10. If a ship be insured for 91⅝ per cent. of its real value, and the whole value of the ship be £6,968, what would a person lose who owned ⅝ of the ship?
11. By selling an article for £19 the seller loses 5 per cent. on the outlay; what would be the loss or gain per cent. if he sold it for £23 15s.?
12. I lent £184 12s. 9½d. on the 12th of March, what interest is due on the 5th of August at 2½ per cent. per annum?
13. I bought an article for 25 guineas cash, and sold it the same day for 30 guineas, allowing 6 months' credit, what was my gain per cent?
14. From a field 328 yards long and 300 yards wide, how many gardens could be formed, each 144 feet long and 75 feet wide?
15. A room is 18 feet 7 inches long, 14 feet 3 inches high, and 14 feet 3 inches wide; what will it cost to paper its walls, the paper being 3 quarters wide and costing 2¼d. a yard, deducting for 4 windows each 12 feet high and 3½ feet wide?
16. By selling sugar at 8d. per lb. I clear ⅛ of my outlay; if I then raise the price to 9¼d.; what do I clear per cent. upon my outlay at the latter price?
17. The prices of a 1st and 2nd class ticket from London to Bath are £1 6s. 10d. and 19s. 10d. respectively, and a person taking 2 second class tickets and 1 first class ticket from London to Reading, on the same line, pays 19s. for the three; find the price of each ticket.
18. The populations of 3 towns in the year 1851 were respectively 42,652, 84,648, and 13,412; in 1861 it is found that the first two had increased 12 and 10 per cent. respectively, and the last had decreased 18 per cent. Find the *average* population of the three towns at the latter period.
19. A sold a piece of cloth to B, who at first offered him 5 per cent. profit, but A got him to give a shilling more than his first offer, by which he found that he had cleared 8⅓ per cent.; find the amount for which A bought and sold the cloth.
20. A person sells £1,000 consols at 94⅞, and on their rising he sells £1,000 more at 95⅝; on their rising again he buys back the whole £2,000 at 96; what does he gain or lose on the transaction?
21. If 27 grains of gold gild a ball weighing 729 oz., how many grains will gild a ball that weighs 1,728 oz.?

BOOK-KEEPING BY DOUBLE ENTRY.

THREE HOURS ALLOWED.

1. In what does the difference between the single entry and the double entry method consist?
2. What is the special advantage possessed by the double entry over the single entry method?
3. What should a profit and loss account exhibit?
4. What should a balance sheet exhibit?
5. Journalise and post, in proper technical language and form, the following imaginary facts and transactions, and draw out from the ledger a trial balance, a profit and loss account, and a balance sheet:—

James Bell and John Lee enter into partnership on the 1st January, 1864.

James Bell's capital was—

In Cash	£2,000 0 0	
In Cotton	1,000 0 0	
	3,000	
John Lee's capital was—		
In Cash	£1,000 0 0	
		£4,000 0 0

N.B.—The capital of the partners bears interest at 5

per cent. per annum, and the net profits are divisible between them in equal moieties.

Subsequent Transactions.

		£	s.	d.
1864.				
Jan. 2.	Bought of R. Black cotton as per invoice	£700	0	0
,,	Accepted R. Black's draft at 14 days due 19th inst.	700	0	0
3.	Sold to Sam. Bow cotton	360	0	0
,,	Received from Sam. Bow his acceptance, due 7th Feb.	200	0	0
	and cash	160	0	0
4.	Bought of S. Tom cotton as per invoice	800	0	0
5.	Paid cash to S. Tom	792	10	0
,,	Abatement allowed by S. Tom	7	10	0
,,	Bought of James Trig cotton as per invoice	600	0	0
,,	Received of James Trig bill, receivable, due 15th inst.	210	0	0
6.	Sold to Sam Bow cotton	700	0	0
,,	Received of Sam Bow his acceptance, due 9th February	250	0	0
,,	Advanced for petty cash	10	0	0
8.	Bought of R. Nix, Manchester, cotton goods as per invoice	670	0	0
,,	Sold to H. Pott cotton as per invoice	480	0	0
12.	Consigned to Ceylon, through Braine and Co., for our own account and risk, cotton goods, invoiced to them at	1,000	0	0
,,	Received of Braine and Co., cash advance on said consignment	666	0	0
13.	Paid to James Trig cash	450	0	0
,,	Cash paid freight and charges on shipment to Ceylon	58	10	0
,,	Paid out of petty cash, postage, &c.	3	17	6
14.	Discounted with D. Gride Sam. Bow's acceptance for £250, due 9th Feb., received cash	248	15	0
	Allowed discount	1	5	0
16.	Bill receivable, received of James Trig, 5th instant, due 15th instant, returned dishonoured	210	0	0
17.	Cash drawn out by James Bell	250	0	0
,,	,, ,, ,, by John Lee	100	0	0
19.	Cash paid our acceptance of R. Black's draft, due this day	700	0	0
,,	Cash placed on deposit at bankers	1,000	0	0
20.	Bought of R. Nix, Manchester, cotton goods as per invoice	325	0	0
,,	Paid R. Nix, Manchester, cash on account	400	0	0
	Our acceptance, due 10th March	200	0	0
24.	Paid out of petty cash for stationery, &c.	4	10	0
31.	Stock of cotton on hand	1,800	0	0
,,	Cotton goods on hand at cost	325	0	0
,,	Salary due to D. Scribe	21	0	0
,,	Rent due to R. Tree	15	0	0
,,	Balance of interest to credit of James Bell	11	17	6
,,	,, ,, John Lee	3	15	0

ALGEBRA.

THREE HOURS ALLOWED.

(A.)

1. Find the greatest common measure of the two quantities, $x^2 - 3x + 2$, $x^2 - x - 2$.

2. Prove that the sum of any two positive quantities must be greater than twice the geometrical mean between them.

3. Multiply $a^2 + b^2 + c^2 - ab - ac - bc$ by $a + b + c$.

4. Find the least common multiple of $6x^2 + 3x - 9$, $2x^2 - 9x + 7$.

5. Express the number 1864 under the form of a series, $a + 5b + 5^2c + 5^3d +$ etc., in such a manner that a, b, c, d, etc., shall be each *positive and less than* 5.

6. Given $\sqrt{5} = 22\cdot3606798$; find, *without division*, the value of $\frac{3}{\sqrt{5} - 2}$ and $\frac{\sqrt{5} - 2}{\sqrt{5} + 2}$

7. Solve the equation system:

$$\frac{2}{x} - \frac{1}{y} = \frac{1}{z}, \quad \frac{2}{y} - \frac{1}{z} = 5, \quad \frac{2}{z} + \frac{1}{x} = 4,$$ and the equation, $$\frac{9 + 4x^2}{3 + 2x} + \frac{9 - 4x^2}{3 - 2x} = 12.$$

8. The sum of an arithmetical series is 90, the common difference 3, and the first term 22. Find the value of the middle terms.

(B.)

9 If A, B, C, D, are 4 points, so situated on a right line that AD, BD, CD, are in harmonic progression, prove that DA, CA, BA, will also be in harmonic progression.

10. If 6 prizes are to be distributed between 4 classes, find in how many different ways the distribution can take place.

11. Find the value of the nth term in the expansion of $\frac{1}{\sqrt{1-x}}$ by the binomial theorem.

12. If $x^2 + bx + c = 0$, be an equation in which b, c, are positive or negative integers, show that the equation cannot have a finite fractional root, and show in what manner this rule may be extended to the equation $ax^2 + b + c = 0$, where a, b, c, are all of them positive or negative integers.

(To be continued).

Fine Arts.

Fine Arts in France.—The accounts of the late Annual Exhibition of the works of living artists have just been published, in outline, and it appears that the total sum taken at the doors was 110,000 francs. The Exhibition was open from the 1st of May to the 15th of June, deducting Sundays, when admission was gratis, thirty-nine days; this, at one franc a head, gives an average attendance on the pay days of 2,820, or little more than two persons to three works of art exhibited; this is certainly a poor result. It must be mentioned, however, that great liberality is exhibited towards the artists, students, and the press, who all have their *entrées* during the whole course of the Exhibition. The number of catalogues sold is stated at 28,000, or one, or nearly one, for every four visits. The refreshment *buffets*, and cane and umbrella stalls, produced to the management about 150,000 francs. This money has been spent in purchases for the national collections. The Luxembourg Gallery, which has been closed for some days for repairs and re-arrangements, is now re-opened, with from thirty to forty new works, principally from the late Exhibition.

Publication of Sketches of Eugene Delacroix.—M. Alfred Robaut, of Douai, has just issued the first volume of a very remarkable work, consisting of admirable lithographic copies of Delacroix's best sketches. The volume issued, which is in folio, contains twenty-seven lithographs, including the famous Arab cavaliers, studies of lions and other animals, "Joseph and Potiphar's Wife," "Death of Lara," Jacob and the Angel," the "Education of Achilles," "Hamlet and Laertes at the Grave," and other well-known specimens. The second volume of this interesting work is in progress. The name of the possessor of each of the sketches engraved is attached—a useful indication in more respects than one.

INGRES EXHIBITION.—M. Ingres, the patriarch of French Art, has for some years abstained from public exhibition, the last time of his appearing being in 1855, but he has just thrown open his own atelier, on the Quai Voltaire, to all lovers of art who will take the trouble to obtain an introduction. The exhibition consists of five works—a "Portrait of Madame Ingres;" "Homer led by a Child," said to be an old sketch recently carried out; "La Vierge Médiatrice;" "Turkish Women at the Bath;" and "The Golden Age." The last is almost a reproduction of a work executed by M. Ingres at the Duc de Luyne's charming chateau at Dampierre. "The Scene in the Bagnio" is one of the most daring works of the artist. The paint on these canvases is scarcely yet dry, and in the corner may be seen the following signature:—"J. D. INGRES, ÆTATIS LXXXIIII!"

COPYRIGHT IN ENGRAVINGS.—The Association for the Protection of Publishers report the total number of piracy cases placed in the hands of the solicitor, or coming to his knowledge, up to the 31st of May, 1864, was 104; of these 97 were piracies by photography, and 7 by lithography. To maintain the publishers' rights, it has been necessary to bring 27 actions, and to institute proceedings in the police court on one occasion. In the residue of the cases, the offenders have paid the expenses and a nominal penalty, promised not to offend again, and signed the declaration to that effect, with a heavy penalty in default. In the cases where actions have been brought, the defendants have paid the costs and small penalties, which have been credited to the proprietors of the several copyrights, and in these cases also the pirates have signed the declaration. In all instances the delinquents have delivered up, to be destroyed, the pirated copies remaining in their possession.

COPYRIGHT.—The Select Committee on the Bill in the House of Commons have reported that, considering the difficulty and complication of the inquiry, they are not prepared to recommend any amendments or consolidation of the law of copyright, without information, which, at this advanced period of the Session, it is hardly practicable to acquire. They recommend that the whole question be referred to a Select Committee next Session.

Manufactures.

STEAM BOILER EXPLOSIONS.—The engineer's monthly report for May, presented to the Manchester Association, says that during the previous month 226 engines have been examined, and 402 boilers, 16 of the latter being examined specially, and 1 of them tested with hydraulic pressure. Of the boiler examinations, 287 have been external, 18 internal, and 97 thorough. The following defects have been found in the boilers examined:—Furnaces out of shape 2 (1 dangerous); fracture, 8 (2 dangerous); blistered plates, 2; internal corrosion, 11; external corrosion, 9 (3 dangerous); internal grooving, 8; external grooving, 4; feed apparatus out of order, 1; water gauges ditto, 9 (1 dangerous); blow-out apparatus ditto, 9; fusible plugs ditto, 2; safety-valve ditto, 1; pressure gauges ditto, 11; deficiency of water, 1; total, 78 (7 dangerous). Boilers without glass water gauges, 5; without pressure gauges, 2; without blow-out apparatus, 22; without back pressure valves, 22. Six explosions have occurred during the month, by which 11 persons have been killed, and 13 others injured. None of the boilers were under the inspection of the Association. One of the explosions, by which one person was killed and two others injured, occurred to the boiler of a locomotive engine, while standing at a short distance from a railway station. The locomotive, which was employed on goods traffic, and had six wheels coupled, was of the ordinary construction, and about ten years old, having been re-tubed two years since. The cylindrical portion of the boiler, as well as the crown of the outer fire box shell, was rent into a number of pieces; while many of the tubes were fractured, and the remainder bowed outwards. The cause of the explosion was attributed, at the inquest, by three successive witnesses, all of whom were practical boiler-makers, to shortness of water and consequent overheating of the plates. This, it was thought, had produced a gas inside the boiler, which, upon ignition from the hot tubes, caused the explosion. A personal examination of the exploded boiler led, however, to a very different conclusion. The crown of the inner fire-box, as well as its sides, were found uninjured, and the roofing stays in perfect condition; while the rents, instead of being in the fire-box, which would have been the case had the plates been overheated, were confined to the external shell, as already described; so that it is clear that the explosion was not due to shortness of water. On further examination, it was found that the character of the water was somewhat corrosive, and the surface of some of the plates had been eaten into indentations by it; while close to the overlap at a longtitudinal seam of rivets, at the left hand-side of the cylindrical portion of the boiler, and in the ring of plates nearest to the smoke box, a deep furrow was found to have been eaten, which ran longtitudinally more than half way across the width of the plate. At this furrow, which was below the water line, the plate had rent, and there can be little question that this rent was the primary one from which the others developed, and to which the explosion had been due; so that the supposition of shortness of water, as well as that of the formation of explosive gases, and the neglect of the engine-driver, may be dismissed, and the explosion attributed simply to weakening of the plates through the furrowing action, which is found to be more or less developed in nearly all boilers, but more especially in locomotives. In another explosion, which also occurred to a locomotive engine, the shell rent at the base of the steam dome, which was shot upwards, and thrown to a considerable distance. From this opening a number of rents radiated, and the upper part of the cylindrical portion of the shell was rent into several pieces. Various considerations left little room to question that the primary rent had occurred at the base of the steam dome, where the ring of angle iron, with which it was attached to the shell, was found to be severed for a considerable distance through the line of rivet holes. This explosion is considered, therefore, to have been due to the existence of the steam dome, and that, had it not been for this, the explosion would not have occurred. The danger of these steam domes has been frequently pointed out to the association; and this explosion, which is by no means singular, affords an additional illustration of the importance of dispensing with them altogether, at all events, in stationary boilers. A good deal of misconception, says the reporter, exists with regard to their efficiency; they are considered by some to make a valuable addition to the amount of steam room within the boiler, and thus to compensate for irregular loads upon the engine. The fallacy of this, however, may be simply shown. Few steam domes exceed by more than four times the capacity of the engine cylinder, so that, even if the dome could be entirely exhausted, it would work the engine but a few strokes; while the entire space above the water line in a Lancashire boiler, 7 feet in diameter and 30 feet long, contains but little more steam than the amount generated every minute when in ordinary work. Again, one foot of chamber room, filled with 60 lb., will only yield four feet at atmospheric pressure; whereas, one cubic foot of the water, which would be of a temperature of 309 degrees Fahrenheit, would yield considerably above one hundred cubic feet of steam at atmospheric pressure. So that a boiler worked at a pressure of 60 ℔. a foot of space, filled with water, has stored up within it more than thirty times as much power as one filled with steam. From this it will be clear that the reservoir of power is not in the steam, but in the water. In order to prevent priming, all that is necessary is to take the steam off at a number of

points, and not to allow a concentrated rush at any one. To effect this, horizontal perforated pipes, carried along within the steam space, which are so widely known, are found to be most efficacious. A considerable number are at work in the boilers under inspection, and give very satisfactory results. Steam domes also are inconvenient. Railway companies frequently refuse to transport boilers with them on. Also, they are an obstruction in getting new boilers into place, and in removing old ones where the head-way is limited, and have to be cut off altogether where it is necessary to revolve boilers in their seats so as to bring the bottom upwards for repair. Again, leakage is constantly found to arise at their attachment to the shell.

Commerce.

Rivers in Relation to Trade and Health.—A paper on this important subject, by M. C. Grimand, of Caux, has been read before the Academy of Paris by M. Dumas. Starting with the theorem—axiom one might almost say—of M. Peligot—"That the water of rivers which traverse the grand centres of population become more impure in proportion to the development of industry, for while the mass of the water remains the same, the causes of impurity become daily more abundant"—the author sets forth the following self-evident principles as regards the Seine:—"That water for consumption should be taken from the river above and not below the city; that the organic matter which mixes with the water of the river takes a long time to destroy; and that the supplies of water for domestic purposes and for cleaning of the streets should be kept separate." The last dictum of course only applies to cases such as that of the Seine, where the source of the water applicable to the former use is not sufficient for both. The water used for the streets of Paris is drawn, not from the Seine but from a canal; this is supplied through pipes to the *fontaines* in the street, and also to all the better houses, while the water of the Seine is still generally furnished by the carriers, who obtain it from the city reservoirs, where it is filtered, and carried in pails, at a great cost, to the consumers. M. Dumas, who is President of the Municipal Council of Paris argues for the completion of the great drainage system (*égout collecteur*), and demands that agriculture shall be put in possession of "those products without a name, which are at the same time so dangerous yet so valuable, and at once elements of life and of death." This is, he says, the great problem of the present day for Paris as it was the other day in London! M. Dumas, in pleading for the improvement of his own capital, naturally enough makes the best use of what has taken place elsewhere, and, at the same time does not spare his contemporaries at home. He says: "If hygienic science had been thoroughly understood when Paris was enlarged, the great houses erected would have been constructed on a plan more favourable to the health of their inhabitants—the rooms would not have been made so small, or with so little light, and the kitchens would not have been made to look into wells;" and, "on what principles," he asks, "are the boulevards and public monuments disfigured by arrangements which offend both the eye and the nose, while the air is vitiated by the concentration of poisonous products?" M. Dumas regards the sullying of the waters of a river not only as an enormous error, but as an act which must sooner or later be remedied; and he asks who shall estimate the cost in human life and suffering of the putrid exhalations of the Thames at low water, when the sewers were emptied into it, or of the effect of the wretched condition of the smaller arm of the Seine on the old city which it washes. The necessity of emptying the sewers of Paris into the river below the city is naturally insisted on, and is self-evident; and every sanitary reformer will endorse the dicta of M. Dumas, who says:—"Everywhere, the practice of adulterating streams by the contents of sewers should be put a stop to; such products should be collected with care, and the bad effect of the decomposition got rid of by their application to agriculture;" and he points to Flanders, Savoy, but most especially to China, as the countries where the greatest care has been bestowed on the collection and application of these "elements of life and death." M. Dumas dwells with proper pride on what has already been done in Paris, but, he says:—"In order to maintain the purity of air or of water, the most scientific and practical systems alone will not suffice, even when perfectly carried out; it is absolutely necessary to grapple with and overcome all the opposition which private interests, affecting an ignorant disdain for science, and mistrusting her recommendations, set up in favour of routine and against the public good."

Cotton.—Messrs. Smith, Edwards and Co., in their circular for June, say:—A marked resemblance is observed between the position of the market now and at this time last year, and it is anticipated by many that the course of prices in the autumn months will be similar. Last year a drooping market in the spring and summer was succeeded by a great increase of the consumption in the autumn, an active trade in Manchester, and an advance in prices of 6d. to 8d. per lb.; this year the improvement commenced in April, and to that extent the revival due in the latter part of the year has been forestalled. But the absorption of Cotton, both in this country and the Continent, is proceeding at a pace which threatens to run stocks very low in the autumn, if not interfered with by other causes. The consumption is going on at the rate of 8,000 or 10,000 bales per week above last year; the export is fully as large, and the supplies available for the next few months promise but a small increase on last year. The last accounts from Bombay (our chief source of supply for the remainder of the year) are more discouraging than any yet received, for it appears that a large portion of the new crop, especially Broach and Dhollerah, must remain in the interior until after the monsoon, *i.e.* till October or November. This is partly owing to organized efforts among native speculators to keep up prices in Bombay, and partly to the long-continued bad accounts going out from this market in the spring, which stopped purchases in the interior and clogged the wheels of business. In addition to this, the G. I. P. railway, which is the great avenue of trade to the Oomrawuttee districts, has fallen out of repair, and suspended the carriage of cotton, so that much of that crop must also lie over till after the rains. For these various reasons it is not thought now that any material increase can take place in the shipments of Cotton till near the end of the year, and the export for some months to come is not expected to be greater than last year. From Calcutta and China a moderate increase of shipments is taking place, and the next Madras crop is expected to be larger, but it is only beginning to arrive, and scarcely counts into this year's supply. The crop in Egypt is thought to be drawing near a close; the excessive prices ruling of late have drained the interior, and it appears likely that less remains to be shipped than after this date last year. From the Brazils and America we see no reason to anticipate any material alteration from the quantities received in the latter half of last year, so that, looking broadly at the question of supply, we see no ground to anticipate other than a very moderate increase for the next few months over last year, certainly not more than sufficient to meet the enlarged consumption. But last year the stock steadily diminished till it reached 150,000 bales in the beginning of November, so that the present relations of supply and demand point likewise to a great diminution this year, if nothing occurs to disturb their natural development. It must be remembered, however, that the platform of price from which we start is much higher than last year. Then it was 21d. per lb. for American and Egyptian Cotton, and 17d. for fair Surat; now it is 28d. for the former and 22d. for the latter. There is besides an uncertain future to the money

market, and the full expectation of renewed pressure later in the year; whereas last season no uneasiness was felt on that score till the beginning of November. These considerations, combined with the anxiety more or less avowed about the course of American affairs, will go far to neutralize the effect of a scarcity of the raw material, and perhaps prevent the advance that would otherwise occur; still it must be allowed that the general sentiment of the trade points at present to higher prices, especially for the better stapled classes of cotton; with respect to them it is sufficient to observe that the stock on hand is 100,000 bales, against 156,000 last year; the quantity expected for the next few months no greater, and the consumption nearly double what it was at this time last year.

Colonies.

Price of Bread in Victoria.—A Melbourne paper says:—" The application to the Government to appoint a commission to discover the cause of the failure of the wheat crop, very naturally recalls the attention to the consequent revolution in the price of bread that has created so much consternation already in Victoria. Happily we are better prepared than any community in the world to hear with comparative stoicism the cry of dear bread. The variety of our resources for food and sustenance has made us comparatively independent of the loaf, and though we never can forego the claims of the staff of life, yet as long the market gardener and the butcher can afford to dispute his supremacy, the tyranny of the baker over our appetites can never be absolute and undivided. The inconvenience felt by us in famine prices in bread, there is a satisfaction in feeling, is the smallest possible. The earnings of labour elevate it beyond the temptation of bread riots. In the old country a great increase in the price of flour means a great increase in crime. For ourselves we are exempt from the calculations and apprehensions associated with this; in most wheat-growing countries the price of labour is measured by the value of food which labour consumes—wages fluctuate with the fluctuations in the price of bread. But in this country wages have never fallen in the same ratio as bread. The present price of bread will therefore well diminish the profits of labour, but it will not disable the labourer. The labouring class, in proportion to the salaried class, is, at this moment, over-paid; and though the labouring class, in common with the whole community, must experience the effects of a higher market, yet the class who will feel it most are the small fixed annuitants. But after all, the endurance of either party will not be tried very long or very severely. With so many foreign markets to depend on the article must be attracted by the high prices from our neighbours to our own, and the re-adjustment of prices to their normal standard ensue as a consequence. Though the bakers announce the prospect of another rise in their manufacture there is no doubt that the mere anticipation will produce an accession of raw material. Competition will open the granaries of the existing holders of flour, even if scarcity and want have failed to open their hearts. Shipments are on the road from California."

Natural History Society of Montreal.— The annual meeting of this society was held at Montreal, on the 18th May. A general resumé of the papers read during the last session was given, and special attention was given to the importance of Dr. Hunt's communication on the earth's climate during the palæozoic period. Dr. Tyndall's experiments would seem to prove that a small per centage of carbonic acid and an additional amount of aqueous vapour, diffused through the atmosphere, would largely economise the solar heat by preventing radiation. In this way the high and equable temperature in the northern, temperate, and subarctic zones, which the flora of the cool period would appear to imply, may perhaps be explained. Attention was then called to the most important scientific fact in the year, the publication of the " Geology of Canada." This was an achievement of which the members of the society might feel proud, as it might be said to emanate from their body. He should only call attention to the two points in Canadian geology which it illustrated. The first of these was the finding of definite traces of life in the Laurentian rocks. This formation and the Huronian system were at one time thought to be entirely devoid of fossils. In the Laurentian rocks two series of beds may be observed of different ages. In the lowest of these, fossils have lately been discovered—' Canada thus far distancing all other parts of the world, so far as yet known, in the antiquity of its oldest fossils.' The order of succession in the Laurentian rocks seems to be the same as that so often represented in other parts of the system. In other words, in all rock formations circles of deposit seem to occur, in which the mineral or mechanical composition of the rock undergoes a series of changes. After this the author proceeded to discuss at considerable length the two conflicting theories as to the causes of the peculiar phenomena exhibited in the boulder and drift clays of Canada. The facts which have to be accounted for are " the striation and polishing of rock surfaces, the deposit of a sheet of unstratified clay and stones, the transport of boulders from distant sites, usually to the north-east, and the deposit on the boulder clay of beds of unstratified clay and sand, containing marine shells." He then stated that he considered the view which ascribes these and other appearances to the action of a " sheet of glacier, several thousand feet thick," upon dry land, to be untenable in the majority of cases. The hypothesis which he was inclined to accept was that which supposes a general subsidence and re-elevation of the land in North-east America, together with the action of the sea and its currents, accompanied at certain seasons with floating ice.

Population of New South Wales.—The following is the official return showing the estimated population of the colony on the 31st December, 1863:—

	Males.	Females.	Persons.
Population, 30th June, 1863	206,156	165,004	371,160
Increase by births............	4,152	3,927	8,079
Increase by sea	5,881	2,685	8,566
Total	216,197	171,636	387,833
Decrease by deaths	1,780	1,196	2,977
Decrease by departure......	4,774	1,143	5,917
	6,554	2,339	8,894
Population, 31st Dec., 1863	209,643	169,297	378,939
Increase on the half-year ...	3,487	4,293	7,779

At present there are no means of ascertaining the number of persons arriving and departing from the colony across the border.

Telegraphs in New South Wales.—The only telegraphic works at present in progress in this colony are three branch lines, which are being carried out under an arrangement with the residents in the several districts that the Government shall receive five per cent. on the outlay. On the line from Braidwood to Queenbeyan a distance of fifteen miles has been cleared, and holes for the posts have been sunk for a distance of thirteen miles. The posts are all erected on the line from Deniliquin to Hay, and fifteen miles of wire are stretched. The line from Wellington to Dubbo has been commenced. The estimates for 1864 being at length passed, tenders will shortly be called for new lines for which money has been voted. These consist of extensions from Mudgee to Murrurundi, and from Braidwood to Araluen, and the continuation of the line to Cooma.

Notes.

The Prince Consort's Birthday.—A letter has been addressed, by command of the Queen, to the Council of the Royal Horticultural Society, saying that, "Considering the interest the Prince Consort always took in this garden, and how much the society owes to his active support and assistance, it would be exceedingly gratifying to her Majesty if the Council shall resolve that his birthday, which falls on the 26th August, should from henceforth be observed by the society as a holiday on which free admission to the gardens should be allowed to the public." This suggestion the Council have adopted, and will take "immediate steps for arranging that the 26th August in each year shall be kept henceforward by the society as a holiday, in the hope of assisting towards bringing to the mind of the present and future generations the virtues of the Prince, and his great services, especially to the working classes."

Newspaper Stamp Duty.—Mr. Abel Heywood, who last year was mayor, and at the last election was nearly elected one of the members for Manchester, has issued the following address to his friends upon the occasion of taking his eldest son into partnership:—"When, in 1831, I commenced the business of newsagent, the periodical press had barely an existence, and no newspaper published in England sold for a less price than sevenpence, the duty upon each paper being fourpence. The *Poor Man's Guardian*, published by Mr. Henry Hetherington, was commenced in 1830, and in 1831 he offered me the agency for Manchester and the district. The size of the *Poor Man's Guardian* was not equal to one half of the *Family Herald*; it was, in fact, a demy sheet, and sold for one penny. The judges in the law courts decided that this small sheet, so unlike a newspaper, was one, and as such ought to pay the stamp duty. It was during the year that an organised struggle of friends of the people commenced for the abolition of the stamp duty, or the removal of the 'tax on knowledge.' In the five years during which this struggle was maintained, 750 persons were fined and imprisoned by the magistrates for vending the *Poor Man's Guardian* and the unstamped press. In the month of March, 1832, the authorities at the Stamp Office in Manchester instituted a prosecution against myself for vending the *Poor Man's Guardian*, and I was committed by the presiding magistrate for the space of four months to the New Bailey Prison. The contest between the Government and the publishers became very severe, the parcels for the country agents were seized by the police and confiscated, servant girls carrying bonnet and other boxes were stopped and searched, the coach offices in London were besieged by the police to capture every suspicious-looking parcel; but the ingenuity of the publishers was a match for them. My parcels were often put in hampers in which shoes are usually packed, and directed to a shopkeeper in Oldham-street who dealt in those articles. In referring you to these circumstances, I desire to tender my most unfeigned thanks to those members of the trade now living who, from the first year of my entering into business, have never ceased to be my steadfast friends. To the trade collectively I venture to express my heartfelt thanks for the encouragement and support they have always given to me, and, at the same time, to express a hope that under the new partnership their favours will be continued. I have now only to say that time has made me a much older man than I was. Like most men who have climbed the hill and faced the breeze for a third of a century, I have lost some of the activity of youth; yet my hair is not grey, nor my health broken, and I still feel a pride in believing that no greater educational engine was ever launched than the Freedom of the Press."

Permanent Exhibitions in Paris.—For some years the French mind, so fertile in ideas, and so apt at organisation, has been bent upon the application of the principle of exhibitions to the commercial wants of industry and art, and in spite of the want of success that has at present attended all such schemes in Paris and elsewhere, new undertakings of the kind are constantly springing up, and at the present moment there are more than one that deserve and attract attention. The *Union Centrale des Beaux Arts appliqués à l'Industrie*, which organised a very successful exhibition last year, has taken premises in the curious old square known as the Place Royale, which is situated in the very heart of the manufacturing quarter of Paris. The intention of this society is, in the first place, to form a museum of the best examples of art-manufacture from all countries and of all periods, for the benefit of the artists and artizans of France, and also a library of such books as may aid the student in his artistic and industrial studies. The library is already partly formed and thrown open to the public for which it is destined. This is a most praiseworthy institution, and cannot fail to be of essential service if well carried out. Another exhibition, of a somewhat different character and on a much larger scale, will be opened in the course of the present month in the Rue Laffitte, in the centre, at once, of the monetary and artistic world; close to the great auction mart where amateurs dispute the possession of the works of genius, and also close to the fashionable highway, the Boulevard des Italiens. This establishment aims at commercial objects through the medium of a permanent exhibition, and there is every appearance of the intention being carried out with spirit. The locality chosen is the famous old mansion of Jacques Laffitte, situated at the junction of the street which bears his name with the Rue de Provence. This house was the head-quarters of the revolution of 1830, and in the *grand salon* was drawn up the draft of the Charter. At that time it had passed out of the hands of the famous financier, and the republic, as a mark of its gratitude, re-purchased and presented it to its original owner, a fact commemorated by an inscription over the entrance in the court yard. The house contains a large number of rooms, some of them of great size, and retaining all their grandeur of decoration; they are now being fitted up with massive and elegant stands in oak for the reception of the articles to be exhibited, and the court yard on the one hand, and the garden on the other, are being covered with glass roofs, and will make two very spacious halls, surrounded by galleries, and communicating on both floors with the house which stands between them. The upper storey of the mansion is being converted into a kind of club, for the convenience of the exhibitors and others, and includes, besides reading, writing, smoking, and billiard rooms, a salon devoted to the use of ladies, which will be provided with a grand piano. The exhibition is to be open to the public daily, from eleven in the morning till eleven at night; and it is proposed to establish sales twice in the year for the disposal of those articles which are no longer necessary for the purposes of the exhibition. The plan is a bold one, and its approaching maturity renders it worthy of attention.

Interesting Archæological Discovery.—Some excavations made on the property of M. Berryer, at Augerville, have brought to light a stone coffin containing the remains of a human skeleton, and several objects of interest, such as a large bowl in bronze with gadroon ornaments; fragments of a silver bowl much oxydized; a large chased gold ring, of the time apparently of the Lower Empire; some fine coloured glass beads, broken glass vases, and a piece of silver money of the Emperor Gratian. The position of this tomb, on the edge of a very ancient road, leads to the supposition that it was not isolated, and M. Berryer has commenced a careful examination of the adjoining ground in the hope of discovering a collection of sepulchres belonging to the period of the Roman domination in France.

Correspondence.

IMPROVED LABOURERS' DWELLINGS.—SIR,—I desire to call the attention of those who are forming plans to provide improved dwellings for agricultural labourers, to what we have long been doing in Poplar and other places, in what we call Freehold Provident Societies. By them we secure compound interest at the rate of 10 per cent. per annum to our members on their savings, and consider that to be the lowest rate of interest that working men should be content with. A knowledge of the mode of accomplishing this will greatly increase the power of the philanthropist who takes upon himself the task of instructing the lowly. Very much higher rates of interest than this may be obtained by the application of the principles of our Freehold Provident Societies to other purposes, as whatever rate of interest men are paying in any shape for other people's money, or for the use of anything bought with other people's money, that rate of interest they can, by combination, obtain for a certainty on their own savings. For our present purpose I desire to confine my observations to what may be done by that kind of combination which secures interest at the rate of 10 per cent. per annum. Each of our Freehold Provident Societies consists of not less than 100 members, subscribing 9½d. a-week, or £2 1s. 2d. per annum. The 1s. 2d. is set aside to pay the expenses of the society, and the £2 per annum, from each member, is used in the following manner:—Every time the money in the society amounts to £200 the members draw lots for it, and he to whose lot it falls purchases with it £200's worth of freehold or leasehold property, pays back the £200 by repaying £20 per annum for 10 years, and continues his subscription of 9½d. per week for 25 years, by which time the last of the 100 members has had his £200, after which each member has his 25 years' subscription returned to him. Thus each member, for a subscription of £50, obtains property of the value of £200, and receives back also his £50. One only out of every 100 has to subscribe £50 before he has £200. The first has £200 by the time he has subscribed £2, and so on. The last served—the one, if you please, worst off—has his £200 75 years sooner than he could have had that sum if he kept his 9½d. subscriptions in his own possession. Each society, with a subscription of £5,000, buys £20,000 worth of property, and returns the £5,000 to its members. The whole of the £20,000 worth of property is purchased in 25 years, and five years are occupied in returning the subscriptions, making the whole period of the society 30 years. The repayment of 10 per cent. can be reduced to 5 per cent. per annum on the sum advanced, or lower still if required, without the slightest damage to the society. Seventy-five out of every 100 can withdraw from the society without damage to those who remain. Those who withdraw can receive back all they have paid to the society, and hereafter will be able to obtain a good premium from others desirous of purchasing their shares. All the details in the working of these societies have been brought to great perfection by 20 years' practise. The first society will be 21 years old on the 4th of August next. The Saint Luke's Society (London) of which Mr. Wood, of No. 26, Luard-street, Caledonian-road, has been a member since its commencement, has a subscription of 1s. 7d. per week, for £200. It had its last appropriation a week or two ago, and will be 21 years old this autumn. Various societies at Deptford are going on. The earliest of them, established in the autumn of 1843, are now held at the Deptford Literary Institution. A former Lord Mayor of London, Mr. David Wire, was for years the treasurer of the first four or five societies. By this time the societies at Deptford must have appropriated about £30,000. The various societies in Poplar have appropriated about the same sum. Those in Poplar under my own immediate management, have up to this time appropriated £15,610. The first, which began in August, 1843, with 100 shares, has now 41 shares. Each member who has withdrawn has received back the whole of the money he paid in.

DR.	£	s.	d.
To the Amount of Subscriptions up to the 27th of June, 1864, paid by the 41 Members remaining in the Society	1,750	18	6
The sum repaid off Appropriations	2,977	0	0
	4,727	18	6

CR.	£	s.	d.
By Amount Appropriated.........	4,600	0	0
Expenses for the 21 years.........	120	6	5
Balance	7	12	1
	4,727	18	6

Calculations in great variety have been published long ago, which have been verified in every particular by the working of numerous societies. On these calculations the rules are formed. I enumerate some of the things that our 10th Poplar Society's rules provide for. Any amount may be subscribed. Subscriptions may commence at any time. Members may subscribe for any number of years, from seven to 25. Any member may have, at the end of the 7th year, a sum appropriated to his use exceeding the whole amount he has subscribed. The subscription is 1 per cent. per annum, on the sum to be appropriated to the use of the member. The repayment is 10 per cent. per annum, with power of reduction to 5 per cent., or lower still if required. A great variety of other schemes can be carried on in connection with the society by different sections of the members, without the general and specific business of the society being in any way interfered with. I will give two illustrations of these and conclude: The members of the 10th Poplar Society are divided into three classes. Those who subscribe 10s. a week, those who subscribe 1s. a week, and those who subscribe one-tenth of a shilling or 1¼d. per week. Many shilling shareholders collect from the poor one-tenth of a shilling, and make them the holders of one-tenth of a share, for which each has £25 appropriated to his use; repayment, £2 10s. per annum for 10 years. These sums of £25 can be used to purchase sewing machines, looms, boats, lathes, furniture, pianofortes, to apprentice children, or to purchase plots of freehold ground. Each class of ten 1s. a week subscribers has an appropriation of £250 on an average every 2½ years. The ten composing the class draw lots to ascertain who is to have the £250, but, making such arrangements among themselves previously, if death occurs to a member of that class, the next appropriation that accrues to that class belongs to the survivor of the deceased. Death has drawn the lot. In the case of a widow this can easily be made for her equivalent to an annuity in perpetuity of £20.—I am, &c., T. E. BOWKETT.

Poplar, June 29th, 1864.

To Correspondents.

ERRATA.—In last *Journal*, p. 569, col. 1, line 9, for "of its professors," read "to its professors;" and line 25, for "but the artists having," read "the artists not having."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 8th June, 1864.

Par.
Numb.
347. The Queen, *v.* Bracken and others—Copies of the Informations and Indictments.
350. Electors (Ireland)—Return.

SESSION 1863.

493 (vi.) Import and Export Duties—Return.

Delivered on 9th June, 1864.

359. Colonial Governors—Correspondence.
361. Holyhead Harbour—Further Correspondence.
364. Royal Court (Jersey)—Further Correspondence.
Circassian Tribes—Papers respecting the Settlement of Emigrants in Turkey.

Delivered on 10th June, 1864.

309. East India (Finance and Revenue Accounts).
311. Union of Benefices (Metropolis)—Copy of Scheme.
360. Michael Duigan and others—Memorials.
372. Railways (Deposits of Bonds)—Returns.
130. Bills—Fisheries (Fresh-water).
132. ,, Public and Refreshment Houses (Metropolis), amended.
133. ,, Superannuations (Union Officers).
134. ,, Uniformity Act Amendment.
136. ,, County Constabulary Superannuation.
137. ,, Railway Travelling (Ireland).
140. ,, Game (Ireland) No. 2).

Delivered on 11th and 13th June, 1864.

324. American Vessels—Return.
344. Patriotic Fund—Fourth Report.
354. Navy (Ships)—Return.
355. Malta Dockyard—Additional Correspondence.
362. Navy (Ships)—Returns.
368. Brewers' Licences—Return.
374. Navy—Supplementary Estimate (Vote 10).
158. East India (North Western Frontier)—Return.
322. Fire Engines, &c. (Metropolis)—Return.
341. Transfer of Stock—Accounts.
351. Militia Regiments (Companies, &c.)—Return.
365. Belligerent Cruisers—Additional Instructions to Colonial Governors.
375. Navy (Trials of Coal)—Circular recently issued to the Fleet.
135. Bills—Thames Conservancy (amended).
141. ,, Valuation of Rateable Property (Ireland) (amended).

Patents.

From Commissioners of Patents Journal, July 8th.

GRANTS OF PROVISIONAL PROTECTION.

Air or gases, compressing—1510—T. T. Coughin.
Artificial stone, &c.—1504—R. Bodmer and L. R. Bodmer.
Artillery—1475—M. A. F. Mennons.
Beer-engines—1534—J. Holmes.
Boilers, apparatus for feeding—1485—J. Fletcher and H. Bower.
Bottles, &c., stoppers for—1543—T. O. Dixon.
Boxes, card and millboard—1547—T. J. Denne.
Carbonic acid, manufacture of—1498—G. H. Ozouf.
Carburetted hydrogen, &c.—1513—W. H. Tooth.
Carriages—1550—J. Bottomley.
Chemical retorts, &c.—1374—W. Clark.
Cheese-making, apparatus for—1558—C. H. Pugh.
Churns—1542—W. Carrington and T. Turner.
Coal, &c., dividing—1493—R. W. Thomson.
Colouring matters—1525—R. Smith and C. Sieberg.
Cranes, &c.—1194—J. Booth, J. Booth, and J. Booth.
Crinoline and quilted skirt combined—1516—W. Rowland.
Dyeing and printing—1540—C. A. Martins.
Electrical communicators—1565—J. D. Adams.
Felts, manufacture of—1471—J. Reid and T. Buckley.
Fibrous materials, washing or dyeing—1507—W. Clark.
Fibrous substances, apparatus for spinning—1518—W. Whiteley and G. Harling.
Fibrous substances, cleansing and bleaching—1509—J. H. Johnson.
Fibrous substances, machinery for spinning, &c.—1524—J. C. Brentnall and R. Edge.
Fire-arms, breech-loading—1559—T. P. Saville.
Flax, breaking and scutching—1539—E. Rowland and J. Reid.
Flour-dressing, bolter for—1505—G. B. Morris, W. B. Price, and J. L. George.
Frills, &c., machinery for producing—1527—A. Smith.
Furnaces—1552—T. Whitehouse.
Gaseliers—1495—J. Day.
Gas meter, compensating—1499—G. Newton and J. Braddock.
Gas-meters—1561—J. Jones,
Gates for docks, &c.—1530—W. Crozier.
Glass, grinding and polishing—1519—J. H. Johnson.
Guns, breech-loading—1554—J. Aldred and P. Bainbridge.
Iron and steel manufacture—1514—W. H. Tooth.
Land-culture—1483—A. Ellissen.
Lubricating machinery—1373—R. A. Brooman.
Lubricating frictional surfaces—1557—A. Freeman.
Manure, preparation of horny substances for—1489—W. E. Gedge.
Metals, machinery for cutting, &c.—1535—J. Thompson.
Minerals, obtaining—1500—J. G. Jones.
Mirrors, &c.—1520—J. H. Johnson.
Motive power—526—M. Barland and T. O'Keefe.
Motive power, mechanism for obtaining—1492—S. Young.
Motive power (steam combined with air)—1065—J. Parker.
Moulded surfaces, coating with composition—1515—T. Agnew.
Obstructions at dock entrances, &c., removing—1404—G. Migotti.
Ordnance, mounting and operating—1420—W. E. Newton.
Paper manufacture—1391—E. Ledger.
Paper manufacture—1566—T. Cullin.
Peat, machinery for treating—1511—J. Hodges.
Pile-drivers—1512—J. J. Bennett.
Projectiles—1517—E. M. Boxer.
Projectiles—1521—T. T. Coughin.
Pulley or sheave block—1531—T. Worsdell.
Pumps—1273—F. Noble.
Railways, apparatus for lessening the effects of collisions on—1502—W. Clark.
Railway chairs and sleepers—1494—M. A. Muir and J. McIlwham.
Railway hoists, gearing of—1541—H. Phillips.
Railways, permanent way of—1490—J. Edwards.
Railways, permanent way of—1544—W. E. Gedge.
Railway wheels, &c.—1560—J. Whitley.
Rivetting, &c., machinery—1479—J. Bennie, jun.
Roving frames, apparatus applicable to—1532—T. Mayor.
Roving and spinning frames—1562—G. T. Bousfield.
Roving and spinning—1563—G. T. Bousfield.
Textile fabrics, bleaching—1301—J. Baird and J. McIntyre.
Textile materials, preparing or twisting—1421—E. Suckow.
Textile substances, frames for spinning—1444—R. A. Brooman.
Sails for yachts, &c.—1522—S. G. Hewett.
Sewing machines, &c., regulating speed of—1546—A Smith.
Shears, scissors, &c.—1567—G. Carter.
Ships, machinery for steering—1551—E. A. Inglefield.
Spirituous liquors, distilling—1533—W. A. Abegg.
Stays, apparatus for making and finishing—1556—C. Heptonstall.
Steam-engines—1497—W. E. Gedge.
Steam-engines, exhaust and blast pipes of—1553—G. Spencer.
Steam-engine boilers, preventing incrustation in—1529—J. H. Beattie.
Steam-ships, propulsion of—1508—F. Shaw.
Stoves and stove-grates—1526—J. Jobson.
Sulphate of ammonia and sulphuric acid—1545—J. Forbes.
Sulphuric acid—1538—W. J. Pughsley.
Tubes, &c., manufactured from india-rubber, &c.—1508—W. E. Bowra.
Watches, mechanism applicable to—1487—G. Gondelfinger and J. L. Bichet.
Water, apparatus for raising—1548—J. H. Johnson.
Wearing apparel (ladies'), ornamentation of—1503—W. C. Jay.
Woven fabrics, embossing and finishing—1537—M. Radcliffe.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Caloric or heated air engines—1664—H. Messer.
Litho-chromolitho-typographic press—1623—H. A. Bonneville.

PATENTS SEALED.

3291. M. A. Naylor, T. Naylor, and J. W. Naylor.	102. J. Wadsworth.
77. H. M. Nicholls.	111. W. Tongue.
78. J. Lane.	123. A Shanks.
79. D. Nickols.	481. C. Shaw.

From Commissioners of Patents Journal, July 12th.

PATENTS SEALED.

100. W. Denton & J. Whitaker.	179. W. McAdam.
101. W. J. Murphy.	194. T. Bright.
104. J. Rennie.	215. L. Lindley and F. Taylor.
105. T. W. Plum.	229. J. Gedge.
112. A. F. Henery.	233. E. Atkins.
117. J. Ellis and J. Sladdin.	254. A. Tozer,
118. P. Cato.	272. J. Clegg, J. Smith, and W. Carnelley.
124. E. Whele.	289. A. J. Walker.
128. E. B. Wilson.	335. J. C. B. Salt.
132. H. Attwood.	443. H. C. Gamble.
136. R. W. Sievier.	473. A. Jullienne and J. E. Delacombe.
137. Capt. P. St. George Græme and H. Forbes.	488. W. E. Gedge.
145. L. J. Cohen.	561. W. Dangerfield.
147. C. Billson.	834. L. Cooke.
148. J. D. Jobin.	952. C. Doughty & W. D. Key.
153. N. McHaffie.	990. A. C. Fraser.
154. J. Davies.	1050. J. Russell, jun.
155. J. Bowns.	1053. H. S. Jacobs.
157. J. G. Hinde.	1314. D. Clark.
158. G. E. Donisthorpe.	
169. F. J. Ritchie.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1735. A. Priest and W. Woolnough.	1731. H. Hornsby, jun.
1717. R. A. Smith.	1742. R. Hornsby, jun.
1718. T. Wilson.	1761. P. J. De Rette.
1749. J. C. B. Salt.	1778. A. Topham, J. Topham, & J. Topham.
1757. W. B. Adams.	1751. J. R. Cotter.
1884. C. E. Amos and J. Francis.	

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1873. F. C. Hills.	1962. W. H. Gauntlett.
1882. P. A. le Comte de Fontainemoreau.	1934. J. Loach, J. J. Salt, and B. Day.
1889. W. Burgess.	1971. J. H. Johnson.
1947. W. E. Newton.	2062. J. Clay.
1930. J. Chanter and D. Annan.	

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, JULY 22, 1864. [No. 609. VOL. XII.

Announcements by the Council.

PRIZES FOR ART-WORKMEN.

The Council of the Society of Arts offer prizes to Art-Workmen as follows:—

1ST DIVISION.

WORKS TO BE EXECUTED FROM PRESCRIBED DESIGNS.

CLASS 1.—CARVING IN MARBLE, STONE, OR WOOD.

(*a.*) *The Human Figure.*—Two prizes of £15 and £7 10s. respectively. Subject:—The Boy and Dolphin cast from a chimney-piece, ascribed to *Donatello.*

(*b.*) *Ornament.*—Two prizes of £10 and £5 respectively. Subject:—A carved chair-back.

(*c.*) *Ornament.*—Two prizes of £10 and £5 respectively. Subject:—A *Gothic bracket.*

(*d.*)—Two prizes of £20 and £10 respectively. Subject:—A design by *Holbein,* as an *Inkstand* or *Watch-Holder.*

(*e.*)—Two prizes of £15 and £7 10s. respectively. Subject:—*Head of a Harp* of the period of Louis XVI.

(*f.*) *Ornament.*—Two prizes of £10 and £5 respectively. Subject:—An *Italian picture frame.*

CLASS 2.—REPOUSSÉ WORK IN ANY METAL.

(*a.*) *The Human Figure as a bas-relief.*—Two prizes of £10 and £5 respectively. Subject:—*Raphael's "Three Graces."*

(*b.*) *Ornament.*—Two prizes of £5 and £3 respectively. Subject:—A Flemish salver.

CLASS 3.—HAMMERED WORK, IN IRON, BRASS, OR COPPER.

Ornament.—Two prizes of £7 10s. and £5 respectively. Subject:—A portion of the Pediment of a Gate (German work, date about 1700).

CLASS 4.—CARVING IN IVORY.

(*a.*) *Human Figure in the round.*—Two prizes of £15 and £10 respectively. Subject:—An *Ivory,* by *Fiamingo.*

(*b.*) *Ornament.*—Two prizes of £7 10s. and £5 respectively. Subject:—A pair of *Tablets.*

CLASS 5.—CHASING IN BRONZE.

(*a.*) *The Human Figure.*—Two prizes of £10 and £5 respectively. Subject:—A reduced copy of "*Clytie.*"

(*b.*) *Ornament.*—Two prizes of £10 and £7 10s. respectively. Subject:—A cabinet, by Goutier.

CLASS 6.—ETCHING AND ENGRAVING ON METAL—NIELLO WORK.

Ornament.—Two prizes of £10 and £5 respectively. Subject:—Arabesques, by Lucas Van Leyden, 1528.

CLASS 7.—ENAMEL PAINTING ON COPPER OR GOLD.

(*a.*) *The Human Figure.*—Two prizes of £10 and £5 respectively. Subject:—*Raphael's design of the "Three Graces."*

(*b.*) *Ornament.*—Two prizes of £5 and £3 respectively. Subject:—A German arabesque (16th century).

CLASS 8.—PAINTING ON PORCELAIN.

(*a*) *The Human Figure.*—Two prizes of £10 and £5 respectively. Subject:—*Raphael's "Two Children,"* in the cartoon of "*Lystra.*"

(*b.*) *Ornament.*—Two prizes of £5 and £3 respectively. Subject:—Arabesques, by Lucas Van Leyden, 1528.

CLASS 9.—DECORATIVE PAINTING.

(*a.*) *Ornament.*—Two prizes of £5 and £3 respectively. Subject:—An *ornament,* from *Castel R. Pandino,* near Lodi.

(*b.*) *Ornament.*—Two prizes of £5 and £3 respectively. Subject:—A *picture frame,* in the South Kensington Museum.

CLASS 10.—INLAYS IN WOOD (MARQUETRY, OR BUHL), IVORY OR METAL.

Ornament.—Two prizes of £5 and £3 respectively. Subject:—A specimen.

CLASS 11.—CAMEO CUTTING.

(*a.*) *Human Head.*—Two prizes of £10 and £5 respectively. Subject:—*Wyon's* heads of the Queen and the Prince Consort, on the Juror's medal of 1851.

(*b*) *Animal.*—Two prizes of £10 and £5 respectively. Subject:—*Wyon's "St. George and the Dragon,"* on the Prince Consort's medal.

CLASS 12.—ENGRAVING ON GLASS.

Ornament.—Two prizes of £5 and £3 respectively. Subject:—Arabesques by Lucas Van Leyden, 1528.

CLASS 13.—WALL MOSAICS.

Human Head.—Two prizes of £15 and £10 respectively. Subject:—A work by *Bertini,* of Milan.

CLASS 14.—GEM ENGRAVING.

(*a.*) *Human head.*—Two prizes of £10 and £5 respectively. Subject:—An original Gem.

(*b.*) *Full-length figure.*—Two prizes of £10 and £5 respectively. Subject:—An original Gem.

CLASS 15.—DIE SINKING.

Human head.—Two prizes of £10 and £5 respectively. Subject:—The head of the Prince Consort, by *Wyon,* on the Society's medal.

CLASS 16.—GLASS BLOWING.

Ornament.—Two prizes of £7 10s. and £5 respectively. Subject:—An original in the South Kensington Museum.

CLASS 17.—BOOKBINDING AND LEATHER WORK.

(*a.*) *Bookbinding.*—Two prizes of £7 10s. and £5 respectively. Subject:—An Italian specimen in the South Kensington Museum.

(*b.*) *Leatherwork.*—Two prizes of £7 10s. and £5 respectively. Subject:—A specimen of boiled and cut leatherwork for the outside covering of a jewel casket, the original being in the South Kensington Museum.

CLASS 18.—EMBROIDERY.

Ornament.—Two prizes of £5 and £3 respectively. Subject:—A German example in the Green Vaults at Dresden, or an Italian Silk in the South Kensington Museum.

2ND DIVISION.

WORKS TO BE EXECUTED WITHOUT PRESCRIBED DESIGNS.

WOOD CARVING.

(*a.*) *Human figure in alto or bas relief. Animals or natural foliage may be used as accessories.* 1st prize of £25 and the Society's Silver Medal. 2nd prize of £15. 3rd prize of £10.

(*b.*) *Animal or still-life. Fruit, flowers, or natural foliage may be used as accessories.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

(*c.*) *Natural foliage, fruit, or flowers, or conventional ornament in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

All articles for competition must be sent in to the Society's house on or before Saturday, the 26th of November, 1864, and must be delivered free of all charges. Each work sent in competition for a Prize must be marked with the Art-workman's name, or, if preferred, with a cypher, accompanied by a sealed envelope giving the name and address of the Art-workman.

Photographs, engravings, &c., of the above subjects, may be purcl ased at the Society's house at cost prices. Full particulars, with conditions, may be obtained from the Secretary cf the Society of Arts, to whom all persons desiring to become competitors should apply.

Copies of the following engravings are forwarded to the members with this week's *Journal*, and should be bound with the volume:—

Class I. (*d.*).—Design by Holbein, as an inkstand or watch-holder, to be carved in wood.
Class IX. (*a*).—Decorative Painting. Ornament from Castel R. Pandino.
Class X.—Inlays in wood, ivory, or metal.

Institutions.

The following has been received into Union:—

Kent Association of Institutes.

Examinations.

The Council, having been invited by the Science and Art Department to nominate a limited number of candidates to compete for appointments, as book-keepers, in the Stores Branch of that department, are happy to announce that Henry Kearns, aged 17, Aldershot Institution, and William Heap Bailey, aged 19, Derby Mechanics' Institution, have succeeded in the competition. The conditions of this competition were such that, in making their selection, the Council were restricted by the age of the candidates as well as by the special qualifications required.

Proceedings of the Society.

CANTOR LECTURES.

"On Chemistry Applied to the Arts." By Dr. F. Crace Calvert, F.R.S., F.C.S.

Lecture III.

Delivered on Thursday Evening, April 14th, 1864.

Leather.—The art of the currier. Morocco, Russia, and patent leathers. The art of tawing skins. Chamois and glove skins. Parchment. *Hair*, its composition and dyeing. *Wool*, its washing, scouring, bleaching, and dyeing. *Silk*, its adulterations and conditioning.

I shall have to crave the indulgence and patience of my audience during this lecture, as it will chiefly consist of descriptions of processes for the most part well known to manufacturers and others engaged in the leather trade. Thus, the art of currying, which is applied principally to such leathers as are intended for the upper parts of shoes, for harness, &c., is carried on at the present day nearly as it was fifty years ago, and still is but little known to the public.

Currying.—The objects in view in currying leather are several: to give it elasticity—to render it nearly impermeable—to impart to it a black or other colour, and, lastly, to reduce it to uniform thickness. These qualities are imparted by the following processes: After the leather obtained from hides or the thicker qualities of skins has been damped, it is placed on a stone surface and energetically rubbed, first with a stone, then with a special kind of knife called a slicker, and lastly with a hard brush. The leather is then ready to be stuffed or dubbed, which consists in covering it on the fleshy side with tallow, and hanging it in a moderately warm room; and as the water contained in the leather evaporates, the fatty matter penetrates into the substance of the leather and replaces it. The dubbing process is then repeated on the other side of the leather, which is now ready to be softened and rendered flexible, and this is effected by rubbing it with a tool called a pummel. The leather then undergoes the last mechanical operation, which reduces it to uniformity of thickness by shaving off the inequalities of its surface by means of a peculiarly shaped knife called a slicker. The greatest part of the curried leather is blackened on the grain side by rubbing it with grease and lamp black, and lastly brushing it over with a mixture of grease and glue. I believe that some kinds of curried leather are dyed by a purely chemical process, that of rubbing the tanned skin, first with iron liquor, and then with a solution of gall nuts or other tanning substance. The most tedious of the foregoing processes is that of dubbing, which has been greatly improved of late years by the Americans. The scoured skins are placed in a large revolving drum, of ten or twelve feet diameter, and lined inside with wooden pegs. A certain quantity of tallow is then introduced and the whole set in motion, and whilst the hides are thus tossed about, a current of warm air is passed through the drums, which carries off the moisture and allows the grease to penetrate the hide. By this means thick hide leather can be stuffed in four or five days.

Split Leather.—A large branch of trade has sprung up within a few years owing to the invention of machinery for splitting hides, skins, and kips, by which the quantity of leather has been considerably increased, though I am afraid this has been done at the expense of its quality.

Fancy Leathers.—Allow me now to give you a slight insight into the methods of preparing various fancy leathers, such as Morocco, Russia enamelled, tawed, or kid leather, used for soldier's belts, gloves, &c., and, lastly, oiled leathers, used for washleather, gloves, &c. Until the middle of the eighteenth century Morocco leather was wholly imported from that country, for it was in 1735 that the first Morocco works were established in Paris, and similar manufactories were soon set up in various parts of the Continent and in this country. The process by which Morocco leather is prepared is as follows:—The goat and sheep skins, which are especially used for this branch of manufacture, are softened, fleshed, unhaired, and raised or swelled by methods similar to those already described, but one essential element of success in this kind of leather lies in the perfect removal of all lime from the skins, which is effected by plunging the well-washed skins in a bath of bran or rye flour, which has been allowed to enter into a state of fermentation. The result is, that the lactic and acetic acids generated by fermentation of the amylaceous substances combine with the lime and remove it from the skins. The other essential point is the mode of tanning the skins. Each skin is sewn so as to form a bag, and filled, through a small opening, with a strong decoction of sumac, and after the aperture has been closed the skins are thrown into a large vat containing also a decoction of the same material. After several hours they are taken out, emptied, and the operation is repeated. To render these skins ready for

commerce it is necessary to wash, clean, and dye them. The last operation was formerly tedious, and required great skill, but since the introduction of tar colours, the affinity of which for animal matters is so great, it has become comparatively easy. The skins after they have been dyed, are oiled, slightly curried, and the peculiar grain, characteristic of Morocco leather, is imparted to them by means of grooved balls or rollers. There are two inferior kinds of Morocco leather manufactured, viz., those called *roan*, prepared in a similar way to Morocco, but not grained, and *skivers*, also prepared in the same manner, but from split sheep skins. I owe to the kindness of Mr. Warren De la Rue, the beautiful specimens of leather before me, which will enable you to appreciate the various qualities of these interesting productions.

Russia Leather.—The great esteem in which this leather is held is owing to its extreme softness and strength, its impermeability, and resistance to mildew, which latter property is imparted to it by the use of a peculiar oil in its currying, that is birch-tree oil, the odour of which is well-known as a distinguishing feature of Russia leather. As to its preparation, I will merely state that it is very similar to that of Morocco, with these differences, that hot solutions of willow bark are used instead of sumac; that it is generally dyed with sandal wood and a decoction of alum; and, lastly, as already stated, the birch-tree oil is used in currying it.

Enamel Leather.—This class of leather is usually prepared with calf and sheep skins tanned in the ordinary manner. They are dyed black by rubbing them over with a decoction of logwood, and then with iron liquor or acetate of iron. The leather is softened with a little oil, and is ready to receive a varnish, which is applied by means of a brush. The varnish is composed of bitumen of Judea, copal varnish, oil varnish, turpentine, and boiled oil.

Tawed or Kid Leathers.—The manufacture of this class of leathers differs entirely from that of those already described, as their preservative qualities are imparted by quite different substances from those used with other leathers, the preservative action of the tannin being substituted by that of a mixture of alum and common salt. Let us examine together a few points connected with the production of this class of leather. One of the most interesting characteristics is the method of unhairing sheep, lamb, and kid skins, after they have been well washed and fleshed on the beam. The old process of unhairing by smearing on the fleshy side with a milk of lime, was improved by mixing with the lime a certain amount of orpiment, or sulphuret of arsenic, but Mr. Robert Warrington having ascertained that the rapid removal of hair in this case was not due to the arsenic, but to the formation of sulphuret of calcium, proposed, with great foresight, the following mixture as a substitute for the dangerous and poisonous substance called orpiment, viz.: Three parts of polysulphuret of sodium, 10 parts of slacked lime, and 10 parts of starch. The polysulphuret of sodium may be advantageously replaced by the polysulphuret of calcium. The skins, unhaired by any of these processes, are now ready to be placed in a bran or rye bath, as with Morocco leather, or in a weak solution of vitriol, to remove, as already stated, the lime. After the lime has been thoroughly removed from the skins, they are dipped in what is called the white bath, which is composed for 100 skins of 13 to 20 lbs. of alum and 4 to 5 lbs. of chloride of sodium or common salt, and the skins are either worked slowly in this bath or introduced into a revolving cylinder to facilitate the penetration of the preservative agent, which, according to Berzelius, is chloride of aluminium resulting from the action of the chloride of sodium on the alum. When the manufacturer judges that the skins have been sufficiently impregnated with the above mixture, he introduces them into a bath composed of alum and salt in the same proportions, but to which are added 20lbs. of rye flour and fifty eggs for 100 skins. After remaining a few hours they are removed, and allowed to dry for about fifteen days, and are then softened by working them with a peculiar iron tool, the white surface which characterises that class of leather being communicated to them by stretching them on a frame and rubbing them with pumice stone. A large quantity of tawed leathers are also preserved, retaining their hair, which is done by simply suppressing the unhairing and rubbing processes.

Chamois, Wash, or Oiled Leather.—These classes of leather are named from the fact that formerly they were exclusively produced from the skin of the chamois, but at the present day sheep, calf, and deer skins, and even split thin hides, are manufactured into this kind of leather. I should also state that the employment of this kind of leather has greatly decreased of late years, owing to the general substitution of woollen fabrics in articles of clothing. You will see by the following description that the preparation of this class of leather differs entirely from those previously detailed; the conversion of skins into leather, or from a substance subject to putrefaction to one free from that liability, being no longer effected by tannin, as in the case of hides, and Morocco and Russia leathers, or by the use of mineral salts, as in the case of tawed leathers, but by that of fatty matters, especially animal oils, such as sperm. The skins are prepared in the same manner as for tawed leathers, and then submitted to what is called the prizing operation, which consists in rubbing the hair side of the skin with pumice stone and a blunt tool or knife, until the whole of the rough appearance is removed, and the skin has acquired a uniform thickness. They are then worked on the peg until the great excess of moisture has been wrung out, and plunged into the trough of a fulling mill, to the action of the wooden hammers of which they are subjected until nearly dry. They are then placed on a table and oiled, and several of them, after being rolled together, are replaced in the trough of the fulling mill. When the oil has been thus worked into the substance of the skins, they are removed, exposed to the atmosphere, again oiled, and once more subjected to the fulling mill; after which they are placed in a moderately heated room for a day or two, the object of which is twofold, viz., to facilitate the evaporation of the water and the penetration of the oil, and to create a slight fermentation, by which the composition of certain of the organic substances have undergone such modification as to enable them to combine in a permanent manner with the fatty matters. These processes are repeated until the manufacturer deems the leather sufficiently prepared to be fit to undergo the following operations, viz., to be immersed for several hours in a caustic lye bath, to remove the excess of oily matter, washed, and pegged. It is only necessary to stretch the leather on a table, then on a horse, and lastly between rollers, after which it is ready for the market. The ordinary buff colour of these leathers is communicated by dipping them, previously to the finishing processes, into a weak solution of sumac. Before speaking of the further processes necessary to fit these leathers for the glove manufacturer, allow me to have the pleasure of describing that of Mr. C. A. Preller, whose mode of preparing leather is very interesting, owing to the rapidity with which he converts hides into leather, and also to the remarkable toughness which his leather possesses. To attain these desirable ends Mr. Preller proceeds as follows:—The hides are washed, slightly limed, unhaired, fleshed, and partially dried; they are then smeared with a mixture made of fatty matters and rye flour, which having been prepared a few days previously has entered into fermentation, a process which has so modified the fatty matters as to render them more susceptible of immediate absorption by the hide. I think that this feature of Mr. Preller's plan deserves the serious notice of all engaged in the manufacture of oiled leathers, as it appears to prove that fatty acids (or modified fatty matters) are better suited for combination with skins than neutral fats. The hides, with additional fatty matters,

are then introduced into the large American drums, previously noticed in speaking of currying, and after four days they are removed, washed in an alkaline fluid, worked with a pummel and slicker, and after being dried they are ready for market.

Gloves.—The manufacture of this article is now a most important branch of trade, and is the means of giving employment to large numbers of people in several towns in this country as well as on the Continent. To render the above-mentioned oiled leather sufficiently soft and pliable for gloves it is necessary to submit it to the following further operations:—The Chamois, kid, or other skins are rubbed over with a solution composed of 1lb of soap, dissolved in half a gallon of water, to which is added 1½lb of rape seed oil, and 20 yolks of eggs, or, what has been recently found to answer better than eggs, a quantity of the brains of animals reduced to pulp. The use of the two latter substances is extremely interesting in a scientific point of view, for they both contain a peculiar nitrogenated matter called vitalline, and special fatty matters called oleophosphoric and phosphoglyceric acids, which doubtless, by their peculiar composition, communicate to the skins those properties which characterise this class of leather. The skins are then washed and dyed in various colours, after which they are softened, and rubbed with an instrument adapted to slightly raise the surface, and give it that well-known velvetty appearance belonging to glove skins. I shall not take up your time by entering into the details of dyeing these leathers, but describe the following process for bleaching them:—

Bleaching of Skins.—The only process known until recently for imperfectly bleaching chamois and glove skins, was that of submitting them to the influence of the fumes of sulphur in combustion, or sulphurous acid, but latterly two modes of attaining that object have been proposed. The first consists in dipping skins, for two days, in a weak solution of neutral hypochlorite of soda, washing, drying, and rubbing them with soap and oil. The second mode is to dip glove skins into a solution of permanganate of potash, when they soon assume a brownish colour, due to the liberation of the oxygen of the permanganate of potash, and the fixation of the hydrate of sesquioxide of manganese by the skin. The skins so acted on are washed and then dipped in a solution of sulphurous acid, which becomes converted into sulphuric acid by the action of the oxygen of the sesquioxide of manganese, and the protoxide thus produced unites with the sulphuric acid which is soluble in water. The skins thus bleached when dressed are ready for market.

Gilding of Leather.—The usual mode of ornamenting leather with gold is to apply, in such parts as are desired, a thick solution of albumen, covering those parts with gold leaf, and applying a hot iron, when the albumen is coagulated and fixes the gold. This plan is objectionable when the goods are intended for shipment, and the following method, lately proposed, is far preferable: On the parts required to be gilt, a mixture, composed of five parts of copal and one of mastic, are spread; a gentle heat is applied, and when the resins are melted the gold leaf is spread upon them.

Parchment.—There are two distinct qualities of this valuable material, which has been used from time immemorial as a means of preserving records. The best quality is prepared from young lamb, kid, and goat skins, and the second quality from calf, wolf, ass, and sheep skins. To make parchment the following is the process:—The skins are stretched on strong rectangular frames, limed, unhaired, fleshed very carefully, and rubbed with pumice stone, until they have acquired the proper thickness. They are then dried very carefully in the shade.

Dialysis.—Mr. Thomas Graham, Master of the Mint, has lately drawn the attention of the scientific world to a most remarkable property possessed by organic membranes, of separating, when in solution, crystallisable bodies from those which are not so. The former he names crystalloids, and the latter colloids. For instance, if a solution of sugar (crystalloid) is mixed with one of gum (colloid) and placed in the vessel, the bottom of which consists of a septum of animal or vegetable parchment, the crystalloid sugar will pass through the membrane into the surrounding water, whilst the colloid gum will remain in the vessel. Again, if solutions of iodide of potassium and albumen be mixed together, the iodide of potassium will diffuse itself through the membrane, which the albumen will not do. Also if to an alkaline solution of silicate of soda, weak hydrochloric acid be cautiously added, chloride of sodium will be produced and silica will remain in solution, and if such a solution be placed in the dialyser, the chloride of sodium (the crystalloid) will diffuse itself through the membrane, while the silica (the colloid) will remain behind. It is impossible to calculate the immense service which the discovery of these facts by Mr. Graham will render to physiology, toxicology, and to manufactures, as in fact every day new applications of it are being made in these various departments of human research. Thus, to give an example which has special reference to these lectures, I have lately seen it proposed by Mr. A. Whitlaw to place salted meat in large dialysers, when it is stated that the salt only will be removed, leaving all the nutritive properties of the meat undiminished. Mr. Whitlaw also proposes to dialyse the brine in which meat has been salted, and thus to remove the salt, leaving the juice of the meat available for use, while the salt is again in condition to be employed as before.

It will now be my agreeable duty to examine with you a few facts relating to hair and wool. It is interesting to observe that hair, wool, feathers, nails, and claws, may be all considered as prolongations of the epidermis, and present nearly the same chemical composition, as will be seen by the following table:—

	Epidermis of Man.	Hide.	Man's nails.	Hair.	Quill.	Horse's hoof.	Scale of reptile.
Carbon	50·34	50·89	51·09	50·14	52·43	50·40	53·60
Hydrogen	6·81	6·78	6·12	6·67	7·22	7·00	7·20
Nitrogen	17·22	17·25	16·91	17·94	17·93	16·70	16·30
Oxygen & Sulphur.	25·63	25·08	25·88	25·25	22·42	25·90	22·90
	100·00	100·00	100·00	100·00	100·00	100·00	100·00

These substances have also this peculiarity, that, notwithstanding their great richness in organic matters they are extremely slow to decompose.

Hair.—The only real point of interest connected with hair appears to me to be the question as to what its various colours are to be ascribed, and I regret that here I can only give conjectures and not positive facts. Vauquelin and Fourcroy, who analysed hair most carefully half a century ago, stated that hairs were hollow cylindrical tubes filled with oils of various colours; but Gmelin and others state that the coloration of hairs is due to the different proportions of sulphur that they contain.

Quantity of Sulphur in Hair.

Brown	4·98
Black	4·85
Red	5·02
Grey	4·03

Recently Mr. Barreswil has published a paper, in which he states that the coloration of hairs is probably due to the proportion of iron in their composition, and he argues that as iron is the essential element of the colouring matter of blood, it is highly probable that it fulfils the same office with respect to hair. I may state, *en passant*, that great improvements have lately been made in dyeing human hair. Formerly the patient had to undergo most unpleasant treatment, his head being covered with a paste consisting of three parts of lime and one of litharge. An oil cap was then applied and the patient left for twelve

hours, when the disagreeable operation of removing the mass and clearing the hair was proceeded with. The black dye communicated to the hair in this process was due to the sulphur of the hair combining with the lead of litharge, and forming black sulphuret of lead. The present process consists in cleaning the hair thoroughly with a strong alkaline soap, or a little weak alkali, then carefully applying a solution of nitrate of silver, and lastly a solution of monosulphuret of sodium.

Wool differs from hair chiefly by its property of felting, which it owes to its numerous cross lines or serratures, as they are termed; the finer the wool the greater the number of its serratures. Thus, whilst Mr. Goss has found in the finest Saxony wool, 2,720 of these serratures in a single inch in length, he only found 2,080 in an inch of South Down wool, and 1,850 in Leicester. The wool of sheep can be classed under two heads, that is, into long wool and short wool. Certain classes of sheep will maintain the type or quality of their wool under every circumstance. Such are the original types of South Down, Norfolk, and Dorset, all of which are short wool, and all these sheep feed upon fine and short grass. It has been observed that if they are fed upon coarse grass, their wool will also become coarse. This is also true with Welsh, Scotch, and even Spanish merinos. A further proof that this view appears correct is, that the long-wool sheep, such as those of Leicester, Lincoln, and Kent, feed in valleys where grass is long and coarse. In all cases the size of the animal appears also to correspond with their class of food. Another curious fact is the facility with which one type of sheep will merge into another if they change food and climate. Thus many attempts have been made to introduce into France our Leicester breed, the wool of which is so remarkable for its fineness, length, and silvery appearance. Still, after four or five years' residence there, the wool has lost its most valuable qualities. In fact the sheep are no more the Leicester breed. The coarse wool of sheep, however, such as those of Devonshire, does not appear to be so rapidly influenced by any change of climate which the animal may undergo. The aptitude which various kinds of wool have for dyes is also interesting. Thus the wool of one kind of sheep will not dye with the same facility as that of another; and wool dyes much more uniformly, if the animal has been washed before shearing, than when the washing is performed upon the wool afterwards. Lastly, the wool removed by the liming process before described, will be far inferior in dyeing properties to wool taken from the same kind of animal during life. It may be interesting to some present to know the best method of removing these irregularities. I was engaged during my assistantship at the Gobelins in investigating this matter, and I found that the best plan was to steep the wool for 24 hours in lime water, and then to pass it through weak hydrochloric acid. Wool, as it leaves the animal, is not fit for either dyeing or spinning. Thus when wool is washed with water it yields a large quantity and variety of substances, which in France bear the name of *suint*. The most interesting fact connected with this is, that the 15 per cent. yielded by wool does not contain, as shown by M. Chevreul, any salts of soda, but a large quantity of salts of potash, the greatest part of which is combined with an acid called sudoric; and what increases the interest of this fact is that Messrs. Maumené and Rogelet displayed at the last exhibition salts of potash which they had obtained commercially from this new source. In fact they have established in several of the large manufacturing centres of France, where considerable quantities of wool are used, factories for the extraction of salts of potash from the *suint*, and they supplied the jury with the following particulars:—That a fleece of wool weighing 8 lbs., yielded on the average about $1\frac{1}{4}$ lb. of dry suint, or sudorate of potash, and this would further yield about seven ounces of pure potash. If it is now considered that there is annually twenty million pounds of wool washed in Rheims, thirty millions at Elbeuf, and four millions at Fourmies, it would appear from this quantity that if it were all subjected to Messrs. Maumené and Rogelet's treatment, about $2\frac{1}{4}$ million pounds of pure potash might be recoverable. (For further details on this point see Dr. Hofmann's Report on Chemical Products and Processes in the last Exhibition.) Wool which has been simply washed, as above described, is not sufficiently free from extraneous matters to be fit for application in manufactures. It is necessary that it should be scoured, for which purpose, on the continent, it is allowed to remain for some time in putrid urine, or weak ammoniacal liquor, but in this country it is placed in strong alkaline of soap or soft soap, passed through rollers to press out the excess of soap, together with the impurities which it removes, well washed, and dried. In these operations wool loses in weight above 50 per cent. when of good quality, and above 30 per cent. when inferior. But even then the wool still retains a certain amount of fatty matters, which it yields to hot alcohol.

The following table, published by M. Chevreul, will give you an idea of the composition of wool (dried at 212°):—

Earthy matters	27·40
Organic and inorganic salts, soluble in water (*suint*)	32·74
Fatty matters	8·37
Wool	31·49
	100·000

Elementary composition, C. 50·66, H. 7·03, N. 17·74, O. 22·32, S. 2·25.

Before proceeding further, I should like to call your attention to the curious fact that the fatty matters of wool are completely different from the fatty matters of the animal itself; thus, whilst the ordinary suet will be saponified by an alkali, the fat of the wool will not undergo that change, the stearerine and elearine being only converted into an emulsion. From experiments I have made I am able to state, that the common opinion that the differences in quality observed in various wools are owing to their fatty matters is erroneous, as the pure wool obtained as above yielded to the dyer colours as brilliant as those presented by wools in which a part of the fatty matter still remained. Another important fact connected with the composition of wool is the quantity of sulphur it contains, which does not appear to be part of the fibre, as the matter containing it can be removed by a weak alkali without destroying the fibrous appearance of the wool, although its tenacity is greatly impaired, and its power of taking dye considerably diminished. Another remarkable fact is that when wool is bleached by sulphurous acid (the only agent known which will effect that purpose), it becomes incapable of taking many colours, especially the new and brilliant coal tar dyes. The long-disputed question amongst chemists—How sulphurous acid operates so as to bleach wool?—has lately been solved by Messrs. Leuchs and Weber, who have proved that sulphurous acid unites with the colouring matter of the wool, forming a colourless compound, in proof of which it appears that if the wool is placed in boiling water this colourless compound is dissolved, and the wool regains its susceptibility to dyes, though it is slightly discoloured. A slight amount of alkali added to the boiling water greatly facilitates the removal of this artificial sulphuretted compound. In a paper lately published by Mr. Grothe he states that 100 parts of wool fix on an average 0·67 of sulphur, or 1·31 of sulphurous acid to bleach it, and practically 100 parts of wool require about five parts sulphur to be burnt to produce the result. I should also state that wool must always be wet before being submitted to the fumes of sulphur, and it is always advantageous to pass it previously though a soap lye or weak alkali. Wool so bleached should always be well washed in cold water, to remove the excess of sulphurous acid, which otherwise, if the wool

were subsequently exposed to moisture, might be converted into sulphuric acid and destroy the fibre of the wool. It may be interesting to ladies to know the process used by a French scourer, named Jolly, to restore Cashmere shawls discoloured by time. It consists in dipping them into a solution of sulphurous acid, which bleaches the wool but does not affect the fast colours with which the fibres composing the patterns of the shawls are dyed. The shawls then only require to be washed and pressed to be restored to their original beauty. There is no doubt in my mind that a solution of sulphurous acid might be substituted for the gas in bleaching wool with advantage and economy, owing to the sulphurous acid being in a more condensed form, and in better condition for effecting the bleaching process. A few years ago I took advantage of the fact that wool contains sulphur to produce upon it an artificial lustre. The woollen goods were passed through a weak boiling solution of acetate of lead, washed carefully in pure water, and submitted to the action of high pressure steam, when the lead combined with the sulphur of the wool, producing galena, which gave the wool a lustre. The action was regulated by generating, under the influence of steam, nascent sulphuretted hydrogen from a polysulphuret of sodium, which facilitated the object in view. Wool is generally dyed either in the fleece, after undergoing the processes of washing and scouring, or it is first spun into yarn or worsted. To describe all the various methods of dyeing wool would far exceed the limits of this lecture. The operations of spinning wool into yarn or worsted are purely mechanical, and it is not therefore within my province to describe them. The same remark applies also to the manufacture of felt and shoddy, now so extensively carried on in Yorkshire, and I shall therefore merely refer to one or two points having reference to chemistry, such for instance as the working up of the wool or the cotton in worn-out fabrics. To recover the wool from such fabrics the process is most simple, consisting simply in immersing them in diluted muriatic acid, and drying them at a temperature of about 220°, by which means the cotton is completely destroyed, the wool remaining unaffected. The material is then submitted to the action of a "devil," which separates and blows away the cotton, leaving the wool ready for being worked up. To remove the vegetable fibre with the view of applying it to the purposes for which it is adapted, as the paper manufacture for instance, the following process has been devised by Mr. F. O. Ward and Captain Wynants. The mixed fabric is submitted to high pressure steam (60 to 80 lbs. to the square inch), and under the influence of this high and moist temperature the vegetable fibre remains unchanged, whilst the animal one is so much disorganised, that when the rags are removed from the receptacle and dried, and submitted to the action of a beating machine, the cotton fibre remains intact, whilst the animal matter falls to the bottom of the machine in the form of a dark-coloured powder mixed with small lumps of the same substance; this residue has been advantageously applied as a manure, by these gentlemen, under the name of "ulmate of ammonia." I am happy to state that chemical science has discovered several means of distinguishing cotton from wool when employed in the same fabric, and even of determining their respective weights in the same; but the aid of the magnifying powers of the microscope is often required in investigating the mixtures of wool with flax, cotton, jute, &c., which are now so extensively and so ingeniously spun together. The description of these processes, however, would involve so much technicality, and require so much time, that I must not trouble you with their details. The same remarks apply to the means used for distinguishing the materials used in mixed fabrics of silk and cotton, or silk, wool, and cotton.

Silk.—This material has always been highly-esteemed, owing to its remarkable durability, and to the beauty of the fabrics produced from it. Thus the Chinese have used silk from time immemorial, and the Romans held it in such high estimation that, in the time of the Cæsars, silk was worth its weight in gold. The most interesting fact for us is the date of the introduction of the silkworm into Europe; it is related that in A.D. 555 two monks, returning from the East, concealed some silkworms' eggs in their staves, and having succeeded in rearing the worms, their culture soon spread through Greece and Turkey, and gradually found its way into Italy towards the twelfth century. The silk in use at the present day is chiefly derived from the *Bombyx mori*, but the extensive disease which has during the last 8 or 10 years destroyed very large numbers of the worms, has given rise to great efforts to introduce some new species, two of which, the *Bombyx mylitta*, feeding on the *Palma christi* or castor-oil tree, and the *Bombyx ailanthi*, feeding on the plant from which it is named, have been to some extent successful. The material forming the silk is secreted in two glands placed on the side of the animal's body, whence it passes into an organ called the spinaret, on each side of which are two other glands, which secrete a gummy substance, and this uniting with the former forms the silk fibre. Permit me to add here a fact which I think will interest you, viz., the extraordinary weight of silk which a small weight of eggs will yield. Thus, four ounces of eggs will yield 87,900 to 117,000 cocoons, and as on an average a pound of silk requires 270 cocoons, the four ounces of eggs will give 422 lbs. of silk, or 100lbs. of cocoons yield generally 8 lbs. or about 14 per cent. of silk. The production of silk fibre from cocoons is extremely simple. It is effected by placing the cocoons in boiling water, which softens or dissolves the gummy matter which binds the fibres together, and the end of the fibre being detached and placed on a reel, is easily wound. This is the state in which it is usually imported into this country under the name of raw silk. When two or more of these fibres are slightly twisted together they form what is called tram or weft, and when two of the threads are twisted in opposite directions and laid together they form organzine or warp. To render this substance suspectible of dyeing, it is necessary to remove the gum by an operation called boiling off, which consists simply in boiling the silk for some time in a soap lye, and washing and wringing it well afterwards, in which operation it loses about 21 per cent. The following table will show the chemical composition of silk:—

Gelatine	19.08	Commercial yield 79 per cent of silk.
Albumen	25·47	
Wax and fatty substances	1·45	
Silk fibre.........	54·00	
	100·00	

FIBROINE.

Carbon, 48·53; hydrogen, 6·50; nitrogen, 17·35; oxygen and sulphur, 27·62.

Conditioning Silk.—This expression implies the ascertaining of the real commercial value of silk, or, in other words, its condition, and the necessity of this has been so fully admitted that a conditioning house has existed for 40 or 50 years in Lyons, and its advantages have been so fully appreciated that similar establishments have arisen and are well supported in every town on the Continent, where dealings in silk to any amount take place. I may mention, as an instance of the universal adoption of the practice, that even in Crefeld the finest building in the town is the conditioning house. The result is that on the Continent the intervention of the conditioning house between buyer and seller has become quite a matter of course, with the happy result of abolishing a class of dishonourable dealing, which is eating like a canker into the silk trade of Great Britain. I cannot understand why the attempts made to introduce this admirable system into our country have hitherto met with so little

success, and can only infer that there is an unsoundness in the trade, which places many of the silk manufacturers to a great extent under the control of wealthy merchants, who, it appears, are the chief opponents of conditioning. Otherwise one would suppose that its advantages to all engaged in working up this valuable product are too obvious to require demonstration, for, taking the most moderate view of the matter, the average gain to the manufacture by conditioning will be not less than five per cent, and this loss (if he does not condition) cannot be recovered in any subsequent stage, so that his foreign competitor has in this respect alone an advantage over him of at least five per cent. Allow me to conclude this lecture by stating in a few words how conditioning is carried on. Silk being an exceedingly hygrometric substance—its moisture varying constantly with the amount of humidity and the temperature of the atmosphere—the first operation is to ascertain the total amount of water it contains, for which purpose samples, carefully selected from the bale when it reaches the conditioning house, are weighed in delicate scales, dried in hot-air stoves, and re-weighed, the excess of moisture (beyond the 10 per cent. admitted to be the average normal quantity) being then easily calculated. The second operation carried out in the conditioning house is that of boiling off the samples dried as above, and again drying and reweighing, to ascertain the quantity of soap, oil, sugar, acetate of lead, &c., added to give weight, and the result of this operation is to show a loss of 30, 35, and even 40 per cent., instead of about 21 per cent., which is the average amount of natural gum.

Proceedings of Institutions.

Bacup Mechanics' Institution.—The following members of this Institution have been successful in the recent Examination in Chemistry, under the Science and Art Department of Government. *Inorganic Chemistry*:—W. H. Barr, William Lord, Henry Nuttall, and Geo. W. Sutcliffe, first-class Queen's Prize; Geo. H. Stewart, James Walsh, and J. L. Wolfenden, second-class Queen's Prize; and Robert Stewart, third class Queen's Prize. *Organic Chemistry*:—William Lord, second-class Queen's Prize; Henry Nuttall, G. W. Sutcliffe, and James Walsh, third-class Queen's Prize; W. H. Barr and J. L. Wolfenden, honourable mention; and G. H. Stewart and Robert Stewart passed.

Kent Association of Institutes.—A meeting of delegates, from Institutes in the county of Kent, was held at the Faversham Institute, on the 7th of July. The following Institutions were represented:—Ashford Mechanics' Institute, Mr. Whitfield; Canterbury Church of England Young Men's Literary Association, Mr. W. D. Furley; Chatham Mechanics' Institute, Messrs. H. G. Adams and F. Butler; Faversham Institute, Messrs. F. W. Monk, J. A. Anderson, C. Smith and J. Tong; Ham-street Mutual Improvement Society, Mr. Wiglesworth; Lenham Mutual Inprovement Society, Mr. Smirthwaite; Ramsgate Church Institute, Rev. F. G. Hazlewood and S. Coburn; Ramsgate Working Men's Club, Mr. G. M. Hinds; Sheerness Institute, Mr. Shrubsole; and Sittingbourne Institute, Messrs. Webster and Perraton. The Mayor of Faversham occupied the chair, and after explaining the circumstances which induced the committee of the Faversham Institute to take the initiative in an effort to establish a Union of Institutes in Kent, he referred to the success which had attended such organisations as the Yorkshire Union of Mechanics' Institutes, the Lancashire and Cheshire Union of Institutes, the South Staffordshire Association, the Worcestershire Union of Educational Institutes, the Southern Counties' Adult Education Society, and the Metropolitan Association for Promoting the Education of Adults. He was of opinion that the advantages which might be derived from a well supported Union of Kentish Institutes were so numerous and important, that a consideration of them would lead to the immediate adoption of a proposal which he was about to submit to the Conference. A County Association of Institutes might—1. Publish annual or quarterly reports of the proceedings of the various Educational Institutes in Union. 2. Appoint organising officers to visit Institutes, in order to assist and advise the managers. 3. Encourage persons to undergo the Society of Arts and other Examinations. 4. Offer prizes for Papers and Essays on various useful subjects. 5. Assist in the formation of village libraries. 6. Circulate a list of gentlemen willing to give gratuitous lectures. 7. Supplement the programmes of examinations prepared by various Educational Societies. 8. Improve and strengthen insufficient and feeble Institutes. 9. Promote the establishment of Institutes where none at present exist. 10. Originate methods of rendering the means of intellectual improvement attractive, and at the same time efficient. 11. Hold Conferences for the interchange of experience. 12. Award certificates to encourage persons to avail themselves of the advantages afforded them by Classes and Libraries. 13. Devise means for promoting Physical Education. 14. Remove various obstacles which now impede the progress of Institutes. 15. Constitute a Board of Reference on matters affecting the work of Institutes. 16. Facilitate the holding of Industrial and other Exhibitions. 17. Secure tuition for classes. 18. Lend diagrams for the illustration of lectures. 19. Give publicity to the operations of the Institutes; and, 20. Impress upon the public generally the importance of encouraging the education of youths and adults, especially among the working classes. The chairman concluded his address by moving the following resolution, which was seconded by Mr. Adams, and unanimously adopted:—" That a Union be formed of the several Literary, Scientific, Mechanics, Working Men's Mutual Improvement, and other Institutes of a similar character in the county of Kent, to be entitled 'The Kent Association of Institutes.'" Various resolutions respecting the objects and management of the Association were submitted and approved by the Conference. Rules were drawn up and a Provisional Committee appointed.

EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 576.)

GEOMETRY.

THREE HOURS ALLOWED.

1. Draw a straight line perpendicular to a given straight line of an unlimited length, from a given point without it.

2. If a straight line falling on two other straight lines make the alternate angles equal to each other, these two straight lines shall be parallel.

3. To a given straight line apply a parallelogram which shall be equal to a given triangle, and have one of its angles equal to a given rectilineal angle.

4. If the square described upon one of the sides of a triangle, be equal to the squares described upon the other two sides of it; the angle contained by those sides shall be a right angle.

5. Divide a given straight line into two parts, so that the rectangle contained by the whole and one of the parts shall be equal to the square of the other part.

6. The angle at the centre of a circle is double of the angle at the circumference upon the same base, *i.e.*, upon the same part of the circumference.

7. Upon a given straight line, describe a segment of a circle which shall contain an angle equal to a given rectilineal angle.

8. Inscribe a square in a given circle.

9. Equal triangles, which have one angle of the one

equal to one angle of the other, have their sides about the equal angles reciprocally proportional

10. Describe a rectilineal figure which shall be similar to one and equal to another rectilineal figure.

11. The rectangle contained by the diagonals of a quadrilateral figure inscribed in a circle, is equal to both the rectangles contained by its opposite sides.

12. If a solid angle be contained by three plane angles, any two of them are greater than the third.

Problems.

1. If the straight line bisecting the exterior angle of a triangle be parallel to the opposite side, show that the triangle is isosceles.

2. Given the middle points of the sides of a triangle, construct the triangle.

3. Circles are described on the sides of a quadrilateral as diameters; show that the common chord of any adjacent two is parallel to the common chord of the other two.

4. No parallelogram, except a rectangle, can be inscribed in a circle; prove this.

5. If through any point in the common chord of two circles which intersect each other, there be drawn any two other chords, one in each circle, their four extremities shall all lie in the circumference of a circle.

6. Find the centre of a circle cutting off three equal chords from the sides of a triangle.

7. The straight lines which connect the angular points of a regular pentagon, which are not adjacent, intersect in the angular points of another regular pentagon.

8. If an equilateral polygon be described about a circle it must necessarily be equiangular, if the number of sides is odd, but not otherwise.

9. Describe a circle which shall touch a given straight line at a given point, and bisect the circumference of a given circle.

10. Find a mean proportional between two similar right-angled triangles, which have one of the sides containing the right-angle common.

MENSURATION.

THREE HOURS ALLOWED.

1. A floor is 27 ft. 4 in. long and 18 ft. 6 in. broad, find its area and its cost at 12s. 9d. per yard—

   (1) By duodecimals.
   (2) In any other way.

2. A metre is equal to 39·37 inches, an are is a decametre square, and a litre is a cubic decimetre; compare an are with an English acre, and a litre with a gallon.

3. The altitude of an equilateral triangle is to its base as 13 to 15 nearly.

4. What must be the proportions of a sheet of paper so that when it is folded in half it may still retain the same shape?

5. If A B C D be a trapezium, and C E and D F perpendiculars upon the base A B, prove that

$$2\,ABCD = AE \times DF + BF \times CE.$$

How must this proposition be modified if the perpendiculars fall, not upon the base, but upon the base produced?

6. The end of a rectangular beam is 1 ft. 2 in. by 1 ft. 8 in., its solid content is 18 ft. 33 in.; find its length by duodecimals.

7. Lay down the plan of a field and find its area from the following notes:—

	240	
144	190	
	122	116
120	60	
28	0	62

8. An acre of ground, which is an exact square, is to be enclosed with a wall 6 feet high and $2\frac{1}{2}$ bricks thick; find its cost at 5s. 3d. per square yard.

9. If ten equal circles be arranged round another circle so that each of them touches the two adjacent circles and the inner one, prove that the area of all the circles together will be equal to three times the area of the inner circle.

10. What weight of oil, specific gravity 0·925, is contained in a cylindrical vessel whose diameter and height are each 30 inches?

11. If a sphere be inscribed in a cube the surfaces are to one another as their volumes.

12. A cylindrical column, 10 ft. high and 3 ft. in diameter, stands upon a pedestal 6 ft. high, the top of which is a square 3 ft. in diameter, and the base a square 8 ft. in diameter; find the cost of painting the whole at 10d. a yard.

13. Find the solid content of a frustum of a pyramid in terms of its height and the areas of its top and bottom. Shew that this is greater than the solid content of a prism of the same height, whose base is the section of the pyramid at equal distances from the top and bottom.

TRIGONOMETRY.

THREE HOURS ALLOWED.

1. In any triangle A B C, the sides being $a\ b\ c$, show that—

   (1.) $a^2 \text{ Sin. } 2B + b^2 \text{ Sin. } 2A = 2ab, \text{ Sin. } C.$
   (2.) $(a^2-b^2) \text{ Cot. } C + (b^2-c^2) \text{ Cot. } A + (c^2-a^2) \text{ Cot. } B = 0.$

2. A person at 100 feet from a column observes that it subtends an angle of 45° at his eye (5 feet from the ground); find the height of the column.

3. Find x from the equation—

$$4 \text{ Sin.}^2\, 30 + \tan^2 45 + \text{Sec.}^2\, 30 = x \text{ Cosec. } 30 + 16 \text{ Sin.}^2\, 18.$$

4. If $a = 2$; $c = 3$; log. 3 = ·4771213;
   Log. Sin. A = 9·5228787; find angle C.

5. Two wheels with fixed centres roll upon each other, and the circular measure of the angle through which one turns gives the number of degrees through which the other turns in the same time. Compare the radii of the wheels.

6. If $\dfrac{\text{Sin. }(A-B)}{\text{Sin. } B} = \dfrac{\text{Sin. }(A+C)}{\text{Sin. } C}$; A, B, C, being any angles, then
   $\text{Cot. }(A-B) + \text{Cot. }(A+C) = \text{Cot. } B - \text{Cot. } A.$

7. If $\dfrac{\text{Sin. } x}{x} = \dfrac{2165}{2166}$ find x; and show that it is very nearly the circular measure of 3°.

8. If the sines of the angles of a triangle be in arithmetic progression, the cotangents of the semi-angles will be so also.

9. If $\tan. 3a = (2 + \sqrt{3}) \tan. a$, find tan. $3a$; and shew that $64 (\text{Cos.}^8 a + \text{Sin.}^8 a) = \text{Cos. } 8a + 28 \text{ Cos. } 4a + 35.$

10. If in a triangle—
   $a \tan. A + b \tan. B = (a+b) \tan. \frac{1}{2}(A+B)$, then shall $a \text{ Cos. } B = b \text{ Cos. } A$.

11. In a spherical triangle prove that—

$$\text{Cos. } A = \frac{\text{Cos. } a - \text{Cos. } b \ \text{Cos. } c.}{\text{Sin. } b \ \text{Sin. } c.}$$

12. Deduce from this Cos. a, in terms of the cosines and sines of A, B, C; demonstrate the proposition on which your proof depends.

13. If in a spherical triangle A = B = 2 C, then $8 \text{ Sin. }\left(a + \frac{c}{2}\right) \text{Sin.}^2 \frac{c}{2} = \text{Sin.}^3 a. \ \text{Sec. } \frac{c}{2}$

14. If E = the spherical excess in a right-angled triangle, C = 90°.

$$\text{Sin. } \tfrac{1}{2} E = \frac{\text{Sin. } \frac{1}{2} a. \ \ \text{Sin. } \frac{1}{2} b}{\text{Cos. } \frac{1}{2} c}$$

$$\text{Cos. } \tfrac{1}{2} E = \frac{\text{Cos. } \frac{1}{2} a. \ \ \text{Cos. } \frac{1}{2} b}{\text{Cos. } \frac{1}{2} c}$$

CONIC SECTIONS.

THREE HOURS ALLOWED.

Section I.—Geometrical Conics.

1. Define (1) a tangent, (2) a normal, to a parabola. If S is the focus, P a point on the parabola, and the tangent and normal at P meet the principal axis at T and G respectively, prove that ST = SP = SG.

2. Prove that the locus of the middle points of a system of parallel chords in a parabola is a straight line parallel to the principal axis. What is the analogous theorem in the ellipse?

3. Prove that the parameter of any diameter of a parabola is four times the focal distance of the corresponding vertex.

4. Prove, by the properties of the cone, or otherwise, that in the ellipse the square of the ordinate varies as the rectangle contained by the segments of the major axis ($MP^2 : AM \times MA' :: BC^2 : AC^2$).

5. If T is the point of intersection of the tangent of an ellipse with the major axis produced, then $CT \times CM = CA^2$. Also, prove this theorem by means of projecting a circle into an ellipse.

6. Define conjugate axes, and show that the sum of the squares of a pair of conjugate axes is constant.

7. Prove in the hyperbola that SP — HP = 2CA. By what section of a cone is a hyperbola formed?

8. Draw a tangent to a hyperbola (1) at a point in the curve; (2) from a point outside the curve. Can these problems be done by the ruler only?

9. If a line touches a hyperbola, and is terminated by the asymptotes, show that it is bisected at the point of contact.

10. Find the value of the radius of the circle of curvature at any point of an ellipse.

Section II.—Analytical Conics.

11. Determine the tangent of the angle contained between the two lines $ax + by + c = 0$, $a'x + b'y + c' = 0$.

12. Find the equation to the tangent of the circle $y^2 + x^2 - 2ax = 0$; prove that it is perpendicular to the radius of the point of contact, and that the perpendicular from the origin on it is equal to the abscissa of the point of contact.

13. Prove that the normal to the ellipse bisects the angle between the focal distances. What is the analogous theorem in the hyperbola?

14. If (x, y) is a point on an ellipse, prove that $\left(-\frac{a}{b}y, \frac{bx}{a}\right)$ is the conjugate point. Hence deduce the truth of No. 6 in the preceding section.

15. Find the polar equation to (1) the parabola, (2) the ellipse, the focus being the pole in each case.

16. Prove that the perpendicular from the focus to the tangent of a parabola is a mean proportional between the least distance and the radius vector of the point of tangent.

17. Prove the theorems contained in 5, 7, 9, of the preceding section.

18. Show that the equation to a hyperbola may be put into the form $xy = k^2$.

(*To be continued.*)

Fine Arts.

Fine Arts in Paris.—Amongst the pictures purchased by the Imperial government, and now placed in the gallery of the Luxembourg, is the grand work of Meissonier, "Napoleon III. at the Battle of Solferino." This picture, which measures perhaps twenty by ten inches, is four times larger than any former production of the same artist, and it and its companion of the late exhibition—"Napoleon I. in the French Campaign of 1814"—have enormously increased the popularity of Meissonier. Before these appeared he was the pet of the connoisseurs; now he is, perhaps, the most popular painter in France. He is, however, not at all inclined to repose on his laurels; on the contrary, he seems determined to follow the very unusual course of abandoning his peculiarity, throwing off his mannerism, and trying his skill in the common arena. He is now engaged, it is said, on a large canvas, the subject being "A Charge of Dragoons in presence of Napoleon I." It will be a grand triumph if he should succeed in producing as much effect in a new manner as he has in his own extraordinary one, and there is room to hope that he may do so. He already possesses qualities which few artists combine in their works; his taste is evidently towards repose; most of his best known figures are sitting, lounging, tranquil; but, on the other hand, he has produced two, if not more, works in which the action is most energetic. Everyone knows the wonderful picture called the "Lutte," in which two men who have quarrelled over cards are being separated by their companions; the expression of rage and the fierce action exhibited in every muscle, could scarcely be surpassed. Should Meissonier succeed on a large scale as he has in his wonderful miniatures, he will take rank with the greatest artists in Europe. His attempt even must have a good effect. The huge military subjects which have of late years covered the walls of the Paris Exhibition undoubtedly sometimes exhibit much talent and daring execution, but in an artistic point of view they present little for admiration; occupying acres of canvas they are at once small and coarse in treatment, the details in general laboured, and the colouring glaring and inharmonious. In Meissonier's "Solferino" the details are painted as if under a microscope, and yet the effect of the picture is broad and grand, while many of the large works alluded to are crowded and confused to a painful extent.

Art under Difficulties.—One of the greatest curiosities of the Louvre at the present moment is the sight of an artist born without hands or arms, copying the works of the great masters, and copying them with great success. The way in which he has tutored his feet to the work is so extraordinary that on looking at him one can scarcely divest oneself of the feeling that nature, by way of compensation for the absence of the upper limbs, must have furnished the lower with muscles and nerves of unusual power and delicacy. The name of this artist is Felu; he is Belgian by birth, and has studied in the Academy of Antwerp, which he entered in 1859. His application for admission at once secured the attention of the director, M. De Keyser, by the great beauty of the penmanship, and when it was found that the pen had been held between the toes instead of the fingers, the surprise was great. He was immediately admitted into the classes, made rapid progress, and exhibited remarkable ability. But even more extraordinary than a painter without hands is a sculptor without eyes; M. Vidal, well-known for some years in Paris, and who has produced some extremely clever models of animals in terra-cotta, is completely sightless, yet such is the perfection to which he has educated the sense of touch, that he models both with accuracy and facility. The preliminary study must have been long and laborious, especially if, as we believe, M. Vidal was born blind, or lost his sight at an early age. M. Martin, a sculptor, whose busts are well known and deservedly admired, is deaf and dumb. It would be difficult to find three other instances equally extraordinary and interesting of the pursuit of art under difficulties, in two cases, at least, apparently almost insurmountable.

Discovery of Supposed Works of Holbein.—A curious discovery has been made at Lucerne; in removing some old woodwork in a mansion known as Corrazioni d'Orelli, a ceiling has been discovered, richly ornamented with carved work and painted in fresco. The subjects include the Annunciation, the Resurrection, the Ascension, Saint John the Baptist, Saint Béat, and Saint Rocha,

bishop holding a spit on which his entrails are wound, and another bishop in the act of consecrating a chalice on which a spider is depicted. These paintings bear the date of 1523, and as Holbein decorated several houses at about that period at Lucerne, and from the evidence of the works of themselves, artists believe the paintings to be his production.

Monument to H. Flandrin.—A commission, which includes Comte Walewski, M. Ingres, and Baron James Rothschild, has just been formed to raise a subscription for a monument to the memory of the late able artist, Hyppolyte Flandrin. The *Institut* of France, the House of Rothschild, and the *Gazette des Beaux Arts*, receive subscriptions.

Sale of the Comte de Chambord's Collection.—It is positively asserted that the Palace de Vendramin, in Venice, the property of the Comte de Chambord, with the fine collection of works of art which it contains, is shortly to be sold by public auction. Amongst the works of the modern French school are two famous pictures by Horace Vernet—"The Dog of the Regiment," and "The Trumpeter's Horse."

Fine Art in Italy.—The government at Turin has decided that the fine old palace of the Podestat at Florence (St. Bargello), shall be converted into a national museum of the works of art of the Middle Ages. This palace, one of the finest buildings in Italy, has been many years used as a state prison; it is now to be completely restored, and the carrying out of the work is entrusted to the Chevalier Mazzei. A special commission is appointed to collect and arrange the museum itself, the nucleus of which will consist of the collections now at the Palaces Pitti and Uffizj. Two galleries, one devoted to sculpture and the other to armoury, are ready to be thrown open to the public; the latter contains, amongst other things, complete equipments of the knights of the Black Bands. A professor's chair of archæology is to be attached to the museum.

Catalogue of the Ermitage Collection at Saint-Petersburg.—Baron Kohne, one of the keepers of this collection, has just published a new collection of its contents, which includes from seven to eight thousand works, of which about one quarter are indicated as of high merit: of these 327 are Italian, 944 belonging to the various Teutonic schools, 115 Spanish, 172 French, 8 English, and 65 Russian; Murillo is represented by no less than 20 works, Rembrandt by 41, and Rubens by 60.

Henri II. Ware.—M. Benjamin Fillon, of Niort, who has just published a work entitled *L'Art de terre chez les Poitevins*, has made a rude attack on one of the cherished notions of the connoisseurs of old earthenware; he declares, and it is said that his proofs are conclusive, that the famous set of table ware supposed to have belonged to Henri II. of France, and of which nearly the whole of the pieces known to be in existence were collected in the South Kensington Museum in 1862, and which have been sold from time to time at fabulous prices, was made about the year 1530, in the little hamlet of Oiron, near Thouars, for, and under the direction of, a lady named Hélène de Hangest, a widow who exhibited great love for, and taste respecting, objects of art. If M. Fillon be correct, some people will not thank him for the discovery, and especially the publication of it.

Schools of Art.—The report from the select committee appointed to inquire into the constitution and working of schools of art has been issued, and the recommendations are:—"That a central training school for teachers be maintained as at present, and sufficiently qualified scholars from local schools be admitted to the training school at the expense of the state, the study of decorative art useful for manufactures being the primary object; other scholars should also be admitted to the training school upon payment of remunerative fees. That the collection of works of decorative art at South Kensington be made more generally useful than at present throughout the country, especially in connection with local museums. That a national competition of works from all the local schools of art in connection with the department continue to be held annually at South Kensington, and a limited number of prizes awarded. That local schools of art be left to establish themselves wherever they can take root, and to extend their operations to all classes of society, and to charge such fees as their managers may think suitable. That the conditions of granting any state aid to local schools of art be:—(*a*) that night classes for artisans be open at least three times a week, at fees within the reach of artisans; (*b*) that the teachers be certificated, and receive the whole of the fees of the artisan classes; and (*c*) that the localities provide suitable premises, and pay all charges for rent, taxes, and repairs. That no further grants be made in aid either of building, renting, or repairing schools of art. That no further grants be made in aid of purchasing examples, models, casts, or apparatus. That it be a condition of government aid that a public examination of every aided school of art be held annually, through the agency of its local committee, and that the results of such examination should be reported to the department in such form as the department may prescribe. That payments to certificated art teachers should be so far assimilated to those made to teachers of science, that a capitation payment should be made for every artisan student who has received 40 lessons within the year. That the works of the students in their examination, certified by two members of the local committee as being the students' own work, should be sent up to the central department. That fewer prizes and no medals should be given by the central department on local examinations of aided schools of art. That if ever an inspector reports that an aided school of art is held in unsuitable premises, or uses bad models, examples, or apparatus, or that the teaching is deficient, aid may be wholly or partially withheld until the local committee consent to make such changes as are deemed essential to the proper conduct of the school. That the votes for the museum at South Kensington and for the schools of art should be kept distinct."

Manufactures.

North London Working Classes' Industrial Exhibition.—This undertaking is under the patronage of the Earl of Shaftesbury, Mr. W. H. Bodkin, Assistant-Judge, and other gentlemen of influence. The Committee have issued an address, in which they say:—It will scarcely be deemed otherwise than a natural consequence of the success which attended the Exhibition in Lambeth, that similar attempts should be made in other metropolitan districts. While, therefore, the Committee feel it incumbent upon them to acknowledge the obligation they are under to the promoters of the Lambeth Exhibition for the origin of the idea, they deem it unnecessary to offer any apology for undertaking its further development. Although the nature of the proposed Exhibition is sufficiently indicated by its title, it may be stated, to obviate any misapprehension, that the objects to be exhibited must be the production of the Exhibitor. Such objects will include—I. Articles manufactured in the ordinary way of business, which should, of course, be specimens of superior workmanship or novel design. II. New inventions or original contrivances to economise labour and time. III. Useful, artistic, or ornamental articles which may have been produced in spare hours, whether by working men or working women. The term "North London" is intended to include the districts of Clerkenwell, Islington, St. Pancras, St. Luke's, Hoxton, and St. Andrew's, Holborn. The Exhibition is arranged to take place at the Agricultural Hall in October next. The Committee now, therefore, invite immediate application for space from intended Exhibitors, and earnestly solicit the hearty co-operation of the working classes generally. Printed forms of application for space are

issued free to all applicants by the Secretary, Mr. Watts, 7, Birchmore-terrace, Cardington-street, and others. The time of admission to the Exhibition will be from seven till ten each evening, and the admission will be 2d. each person. On Mondays and Wednesdays the Exhibition will be open from ten till five o'clock, 6d. for each person; children, 3d.; and on Saturdays, from ten till three o'clock, at 6d. each, and from five till ten o'clock, 2d. each. Previously to the opening of the Exhibition, a number of gentlemen, unconnected with the management, will be invited to meet the Committee and award Prizes of Merit (not pecuniary) to the Exhibitors.

The Industry of Paris.—The Chamber of Commerce has just published a report, which contains a comparison of the statistics of Paris industry of 1860 and 1850. It appears by this document that the number of manufacturers in Paris is 101,171, of whom 87,850 are within the old limits of the city, and 23,321 in the recently annexed communes. Of these only 7,492 employ more than ten workmen each, 31,480 have from two to ten men under them, while 62,199 employ only one workman or none at all. The annual value of the productions of these 101,171 manufacturers is set down at 3,369,092,449 francs per annum, or about 33,690 francs (£1,347) on an average for each. The total aggregate rent paid is said to be 107,390,710 francs, or, on an average, £43 a year. The labouring class employed in this industry is stated at 488,081 persons, of whom 355,692 are men, 126,134 women, and 26,255 children. The average rate of wages of the men amounts to 4fr. 33c. a day, and that of the women to 2fr. 1c. Out of a hundred workpeople, 71 have their own furnished apartments, 18 live in ready furnished lodgings, and 11 live with their employers; and 67 can read and write. The steam power employed is said to consists of 1,185 engines of, together, 9,748 nominal horse-power; and the number of sewing machines to amount to 2,097, furnishing employment to 21,000 workwomen. Of course this does not include the sewing machines used elsewhere than in recognised workshops.

Spinning School at Mulhouse.—A school for teaching weaving was established at Mulhouse three years since, and has been eminently successful; the same principle of industrial education is now being applied to spinning, a school for that purpose being now in process of organization in the same town, and will be ready to receive pupils in October, when the regular winter educational session commences. The Alsacian manufacturers exhibit great wisdom and foresight in these establishments for technical education, than which nothing is so likely to conduce to the maintenance and improvement of their manufacture. The great centres of English production should study with attention these important movements.

Sugar Manufacture.—Messrs. Travers and Son, in their circular, quote a paragraph from the *Morning Post*, stating that "Accounts from Havana mention that M. Reynoso, the distinguished Cuban chemist, had left for Europe in a British steamer, to perfect a discovery of his, which, it is alleged, is to work a revolution in the manufacture of sugar. The problem the inventor thinks he has solved is one that has occupied the attention of chemists for years, and consists in so treating the fresh cane-juice that there shall be no residue, but all be converted into sugar of equal quality and fineness. M. Reynoso's friends have subscribed 35,000 dollars to enable him to prosecute his researches and experiments in Europe. Should he succeed, all sugar-planters will probably conform to the new system, and no more Muscovadoes will appear in the price current." In commenting on this statement Messrs. Travers say:—"The writer evidently did not read that part of our Chancellor's financial statement in which he distinctly avows his intention so to adjust the duty here as to put the English refiner and the refiner abroad on equal terms, and forgets that he has shown his good will by making the English consumer pay 12s. 10d. per cwt. on all foreign refined sugar, but only 8s. 2d. upon Indian Jaggery. If, therefore, M. Reynoso succeed, as we sincerely hope he will, in perfecting his discovery, he must recollect that whilst Mr. Gladstone is in power his invention will only close our market more firmly than ever to his Cuban sugars, and that if the latter are to be made all pure and all white at but slight extra cost, the Chancellor's principles of political economy, which demand that the foreign and home refiner shall be handicapped, will force the public here to pay an extra tax before it can use these pure white sugars. If the economy of Mr. Reynoso's process be so great as to more than countervail this protection, Mr. Gladstone's well-known consistency will prompt him to raise this protection to whatever point may be necessary."

India Rubber Telegraph Wires.—Messrs. Wells and Hall are now manufacturing, for Government telegraphs, India rubber covered wires, which consist of a No. 18 (diameter ·043) tinned copper, insulated to a total diameter of ·25-inch. Weight of copper per mile, 30lb; weight of insulator per mile, 60lb. The resistance of the insulating medium for one mile, tested in water at a temperature of 60° Fahr., is 4,750,000 Siemen's units; and the resistance of the conductor 54 Siemen's units. The insulation tests, both static and dynamic, appear to be of a high character in comparison with results obtained on other materials. No tar is to be applied to this core, on account of its deteriorating effects when brought into contact with the rubber.

Commerce.

The Currant Trade.—A letter from Patras, dated 28th June, says that, "on the whole, the fruit is progressing very favourably. The total yield, partly owing to the increasing production of the young plantations in the Morea, promises to exceed that of all former years. Until within the last two days the weather has been unusually cool, retarding the fruit, which even in the early districts is, at least, a week later than last season; the change to hot weather, however, may cause it to fill out more rapidly than usual, and diminish the difference. The blight, favoured by the damp atmosphere, has developed itself with much force this season, and several applications of sulphur have been required to check it. Prices, we have every reason to expect, will be very moderate. With regard to the export duties, it is almost certain that they will remain unaltered for this year, notwithstanding the annexation of the Ionian Islands to Greece." Another letter from Zante, of the 30th June, says:—"The cultivation and sulphuring of our currant vines have been attended to with the usual care, so that although, from the blighted appearance of non-sulphured plants, it is evident that the blight is as virulent as ever, still, as in former years, we are not apprehensive of any ill results to our currants. There is an abundant show of well-grown bunches of fruit on our plants, and our prospects for quantity and quality are about on a par with what they were at the same season last year. When it is taken into consideration, therefore, that last year the weather at the latter stage of the season was not over favourable to the proper ripening of the fruit, and that the greater part of it was ultimately caught by rains on the drying grounds, it may be safely inferred that if this year we are favoured by the weather to the end, we shall have a slight increase on the quantity produced last year of about 6,400 tons, and have, moreover, a finer and cleaner quality of fruit. Notwithstanding the cession of these islands to Greece, no change has yet been made in our duties, and none can well be made before the new constitution is drawn out and other formalities gone through."

The Sugar Trade.—The following communication from Brussels appeared in the *Journal de Liège* of the 1st July:—"It is known that a French Commission,

composed of Messieurs Herbet, Ozenne, and Barbier, have been entrusted by their government to prepare a scheme of international legislation with regard to sugar. After having commenced their labours by a visit to Holland, they arrived yesterday at Brussels, and are now engaged in conference with the Minister of Foreign Affairs, M. le Baron Lambermont, the Secretary-General of this department, and with Messieurs Fisco and Guillaume, superintendents to the Finance Minister. It is believed that the French delegates have every prospect of success, and it would appear that we may hope for the speedy realization of the Sugar Zollverein, that France aims at, in which Belgium is equally interested. From here (Brussels) the delegates will proceed to England."

The Flax Crop on the Continent.—The "Belfast Linen Trade Circular" states, with regard to the districts south and north of Holland, Zealand, and North Braband, it is the general opinion that fully as much flax seed has been sown as in 1863; that more acres have been sown with first growth from Riga seed, than with Riga seed, and that the crop in general can only be called middling. In the Biesbos (North Braband) about 600 acres have been sown, of which three-fourths may turn out a first-rate crop with good seed. In the Haarlemmermur the crop looks well enough, and though the length is somewhat irregular, the, quantity and quality are expected to be but very little beneath 1863. Prospects for seed are favourable. The crop in the Hockschen Warrd and Brielsch Island, where flax has been sown to a greater extent than last year, is considered below an average one, and some early sown districts have come up rather sparingly and irregular; but the flax has obtained a good length, and the prospects for seed are fair. In the Western part, flax has suffered much by hail, but the latter sown, which came up somewhat too full, suffered by grub, and has been beaten down by the late rains. In North Braband, the growth is even below an average, excepting some fields which failed totally; the flax is in general thin and short, and has, with few exceptions, suffered by grub, so that prospects are anything but favourable. The great damage done to several fields is principally owing to the cold, rainy, damp weather. The crop is estimated one-third less in weight, and thereby quality has suffered in proportion. In the so-called "sand districts," where also some flax has been sown, a small crop is expected. In North Holland, where the same number of acres has been sown as in 1863, the early sown has come up rather short, and not full enough; amongst the latter sown there are some good fields, but generally speaking, only a middling crop is expected. In the West land, sowing is equal to last year; the flax is thin, and even below an average. In the Island Ysselmonde, more was sown than last year, and flax may be called good; growth regular, of a fair length, and prospects are favourable for the seed crop. In the Western parts, many fields have suffered by hail. In Zealand, much flax has been sown again; in most districts it is short and thin, and though in other parts it is somewhat better, it may still be said that prospects in general are not favourable.

Wool.—The third series of this year's public sales of colonial wools was fixed by the importers to commence in London on the 21st inst. Judging from the present arrivals the quantity to be offered at sale will probably reach 140,000 to 150,000 bales, and notwithstanding that a certain proportion is likely to be held over for the November sales, this will be the largest on record. Considering the enormous scale on which consumption keeps going on, and the generally small stocks in manufacturers' hands, very firm, and some think even higher prices than those obtained at the close of the last sale may be expected, especially as the monetary market has since become more easy. Our domestic wools have nearly recovered the decline from the high prices ruling until clip time, which they experienced, and will probably continue to improve.

Colonies.

Salmon in Tasmania.—The introduction of salmon into Tasmania may now be regarded as *un fait accompli*. About 30,000 healthy ova were placed in the breeding ponds between the 21st and 23rd April. The first fish made its appearance on the 5th May, and since then there were 100 healthy young salmon swimming in the pond. A number were brought into existence with crooked backs, and these of course died; and it now appears that it would have been much better if some of the ova had been more slackly packed. The tightly-packed boxes were not in so good condition as the more slackly-packed ones. The hatching of the trout was complete, but their number is not stated. The little fishes are remarkably healthy, only one of the whole number hatched having died. The Melbourne papers say that several of the salmon ova have been hatched there.

The Board of Agriculture at Melbourne have decided to offer premiums as follows:—£30 for the best and £20 for the second best sample of cotton grown in the country of not less than half-a-hundred weight, the same to become the property of the Board, for the purpose of being forwarded to England to test its value as an article of export; £20 for the best sample of silk produced in the colony; £15 to the person or persons who had most turned public attention to the subject in the year 1863-4; and £15 to the person who shall have done most to the cultivation of the white mulberry in the same period; £30 for the best, and £20 for the second best, for the owner of a hop garden; and £30 for the best sample of hemp, and £20 for the second best. The recommendation of a sub-committee, that £10 should be appropriated to purchasing Durham mustard seed was adopted; but a recommendation to grant a premium for the best sample of colonial flax was rejected on the ground that flax could not be grown profitably in Victoria at anything like the present and prospective rate of wages.

Commerce in South Australia.—During the earlier part of April there was a steady improvement in most imported goods, but later arrivals had given some check. Prices were, however, maintained, and with the present steady trade the effect was not likely to be felt for any length of time. There was, towards the close of the month, a falling off in the export of cereals, and there were no orders for shipping. However, the supply was very limited, and stocks in town and port were increasing but very slowly. It would require only a small amount of orders to cause a rise in prices, more particularly as the supply will decrease as the farmers begin to prepare the ground for sowing the next year's crop; and the rains having begun so late this season, but few of the growers would bring any wheat till the seed was all in. The reports from the mines in the north and south continue favourable, except those in Yorke's Peninsula. The miners have struck for wages, and it is feared it will be some time before matters are arranged. The vintage is finished in the plains, but in several of the large vineyards of the hills it has only just begun, and it is feared that the recent rains will have a deteriorating influence on the quality of the vines. With this exception, the grapes having well ripened, the produce of this vintage is superior to those of preceding years.

Sheep.—An Adelaide paper says that during the fortnight preceding January 4, no less than 50,000 sheep from South Australia crossed the Darling for the stations on that river and on the Murrumbidgee and Loddon, and 100,000 more were expected to cross during the next three weeks.

Customs Duties in Canada.—The government proposes that on gin, rum, and on all other spirits except whisky, an additional specific duty of 15 cents per gallon be imposed. On whisky 15 cents additional. On brandy 15 cents specific additional; and that on ginger wine, as a cordial, a duty of 20 cents per gallon be imposed hereafter.

The government proposes to raise an extra million of dollars this year, and this is one of the methods it intends adopting. Another is a stamp duty. This is new in Canada; it has always worked well in England, and does not affect the poor man. The law proposes to affect notes over 20 dollars, and all amounting to or under £100 will pay a stamp tax of only 3 cents. Bills of exchange will also pay only a tax of 2 cents. The amount is small, but will realise a considerable sum, and perhaps will prove the least burdensome method of assisting towards meeting the deficit in the revenue.

Notes.

The Davy Memorial.—The inhabitants of Penzance are about to erect a monument to commemorate the services rendered by Sir Humphrey Davy to abstract and practical science. This proposal, which has the support of Lord Brougham, Professors Faraday and Williamson, Sir Charles Lemon, and many other men eminent alike in literature and science, has been long talked of; but the calls for help consequent upon the Hartley Mine catastrophe, the Lancashire distress, and several local accidents, have deferred its vigorous prosecution. Originally a very elegant monumental tower was proposed to be erected; but in consequence of two ladies offering the sum of £1,000 if the testimonial took the form of alms-houses, a memorial of that kind, in conjunction with a statue, has been determined upon. Since that time other sums have been offered, and the committee have now available funds to the extent of £1,400, which have been collected. When all that Davy accomplished for the benefit of science and humanity is taken into account, it appears a standing reproach to our country that no monument exists to commemorate his worth. His invention of the safety lamp, his application of the decomposing power of the voltaic battery to chemical research, and his brilliant discovery of the metallic bases of the alkalies and earths, which is the foundation of all modern chemistry, surely have as strong a claim to be commemorated in some permanent manner as the deeds of military heroes, however brave.

Thames Embankment.—The foundation stone was laid in front of Whitehall stairs on Wednesday last, by Mr. Thwaites, Chairman of the Metropolitan Board of Works.

Fishing by Electric Light.—A first attempt was made to fish by electric light a short time since at Dunkirk. The light was supplied by a pile on Bunsen's principle, composed of about 50 elements, and it succeeded tolerably well, but the employment of the pile was attended with much inconvenience. It was then determined to repeat the attempt with a magneto-electric machine. The new experiments tried at Dunkirk and Ostend had a double object—1, to prove how the light produced by the machine would act under water; and, 2, to discover the effect the light would produce on the fish. The first object was completely accomplished, and it is now demonstrated that magneto-electric machines and the light they produce are applicable to all submarine works. In fact, this light was constant at 180ft. under water, and it extended over a large surface. The machine, nevertheless, was placed at a distance of more than 300ft. from the regulator of the electric light. The glass sides of the lantern remained perfectly transparent, and the quantity of carbon consumed was less than if it were in the open air.

Combustible Goods.—A merchant at the East end of London has been fined £20 for having sent by the North-Western Railway a package containing highly combustible goods ("blazing fusees"), without giving notice that they were dangerous.

Correspondence.

Safety in Railway Trains.—Sir,—In the report read at the General Meeting of the Society no mention was made of the committees appointed some time since, nor was any allusion made to them during the meeting. Probably they are supposed to be defunct, and if so, if I may judge from the Mechanical and Engineering Committee, the difficulty has been to bring forward definite and practical objects on which the attention of the committee might be brought to bear. It has occurred to me that even if nothing else presented itself, one object alone might well receive the attention of the Mechanical Committee, and if it be defunct it would be worth reviving it, for the purpose, namely, to consider the best means of giving railway passengers the means of communicating with the guards of the train. The recent tragedy cannot but draw public attention again to the subject, and it would be useless to lengthen this letter by referring to other instances in proof of its desirability, or more correctly, its necessity. Many letters and suggestions have, and no doubt still will, appear in the public press, proposing apparently simple but really crude and impracticable plans of meeting the difficulty, most of which have been thought of and exploded many years since, as they overlook the essential point of any practicable plan, which is, to enable passengers to communicate with the guard without stopping the train, giving the guard alone the means of communicating with the engine driver. Some years since a murderous attack, which happened also on the North London Railway, led me to bring forward a scheme, which I laid before some of the principal officers of our chief railways. They all received me with courtesy and gave it their attention; some of them distinctly expressed their approval of it, but candidly told me the railway directors would never adopt anything of the kind until forced to do so by the public. The public press also spoke favourably of my plan, and it was exhibited at the Polytechnic Institution. In nearly every case on my first interview with the railway officials, I was met by the cogent objection, "That it would never do to give every nervous old woman the means of stopping the train when she happened to be frightened;" but I met such remarks by pointing out that the object I had in view was to enable passengers to communicate with the guards without stopping the trains, and this certainly must be the principle of any practicable scheme. My present purpose, however, is not to bring forward and describe my own plan, so much as to suggest that the Society of Arts should call together its Mechanical Committee for the definite purpose of considering the subject, and that they invite information and plans from all and any quarter, and should they on due consideration be convinced that any one or more practicable plans can be suggested, the committee should then propose that the whole influence of the Society of Arts be brought to bear on the public, on the legislature, and on the railway authorities, so as to secure a practical trial. The Society not long since took the initiative in the matter of artistic copyright, and were successful; certainly this subject is of equal importancee and falls as legitimately within the province of the Society, It is a matter which will never be satisfactorily deal. with by railway directors unless extraneous influencet oblige them. At the time I was endeavouring to draw attention to my plan, a well-known engineer told me that some years since he was commissioned by the directors of one of the principal railways to investigate the matter, and they invited communications on the subject. I think he said that about sixty plans were laid before him, some remarkable alone for their absurdity, such as shooting an arrow at the head of the engine driver, but others were made the subject of actual experiment. On some he reported favourably, and considered them quite practicable, and there the matter ended. It is just at this point a disinterested and influential body like the Society of Arts could bring its influence to bear by enforcing attention to the subject, and, if necessary, urging the legislature to interfere.—I am, &c., W. Symons.

17, St. Mark's-crescent, Regent's-park, July, 1864.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 11th and 13th June*, 1864.

142. Settled Estates Act Amendment.
High Court of Admiralty in Ireland Commission—Report of Commissioners.
New Zealand—Further Papers.
Education—Report and Appendix.
New Zealand—Papers relating to a Loan to meet the Expenses of the Native War.

Delivered on June 14, 1864.

349. Poor Relief—Report, &c., from the Select Committee, with Appendix.
143. Bill—Accidents' Compensation Act Amendment.
Transportation—Extracts of Despatches and Petitions from the Governors of the Australian Colonies.

Delivered on 15th June, 1864.

337. Shipping—Returns.
342. Yachts and Fishing Smacks—Return.
356. Greenwich Hospital—Memorandum.
357. Coals, Cinders, and Culm, &c.—Account.
363. Transfer, &c., of Land—Return.
51. Bills—Poor Law (Ireland) Acts Amendment.
139. ,, Municipal Corporations (Ireland).
144. ,, Greek Loan.
145. ,, Common Law Procedure (Ireland) Act (1853) Amendment (Lords Amendments).
146. ,, Lunacy (Scotland).
148. ,, Chimney Sweepers' Regulation.

Delivered on 16th June, 1864.

290 (I). Sheffield and Bradford Reservoirs—Report.
358. Public Income and Expenditure—Account.
366. Superannuation Act—Correspondence.
385. Ashantee War—Extract of Despatches.
386. Bankruptcy—Return.
388. Judgments (Courts of Common Law)—Return.
147. Bills—Local Government Supplement (No. 2).
149. ,, Pier and Harbour Orders of Confirmation (amended).
Poland—Communication with the French Government.
National Education (Ireland)—Thirteenth Report of the Commissioners.

Delivered on 17th June, 1864.

393. Cape Coast—Statements.
152. Bills—Portsmouth Dockyard (Acquisition of Lands).
153. ,, Poor Law Guardians' Elections.

Delivered on 18th and 20th of June, 1864.

381. Navy ("Ship Research")—Report.
382. Land and Marine Forces (Religious Denominations)—Return.
55. (VII.) Railway and Canal Bills—Eight Report.
260. (II.) Decimal System of Measures—Further Return.
384. Inclosure Commission—Special Report of the Commissioners.
390. National Education (Ireland)—Return.
392. Army (Manufacturing Establishments)—Return.
151. Bills—Naval and Victualling Stores.
157. ,, Punishment of Rape.
158. ,, Insane Prisoners Act Amendment (Lords Amendments).

Patents.

From Commissioners of Patents Journal, July 15th.

GRANTS OF PROVISIONAL PROTECTION.

Air-canes—1182—S. Dreyfous.
Air-engines—1578—M. Henry.
Alkalies, &c., processes for obtaining—1375—F. O. Ward.
Aniline colours—1669—G. Phillips.
Armour for ships, &c.—1659—J. H. M. Van Buren Whisker.
Bedstead—1586—W. E. Gedge.
Beer-engines—1606—W. Perks, jun.
Boilers, preventing incrustation in—1587—G. T. Sims and J. Pendley.
Bread-manufacture, machinery for—1588—W. A. Guy, E. Edwards, and R. W. MacArthur.
Bread-manufacture—1589—R. W. MacArthur, W. A. Guy, and E. Edwards.
Brick-making machinery—1667—B. C. Sykes.
Bubble-blowing apparatus—1613—W. E. Newton.
Candles, prevention of guttering—1607—H. C. Steane & F. A. Steane.
Clips for binding manuscripts, &c.—1600—H. Jenkins, J. Jenkins, F. Jenkins, and S. Jenkins.
Cops, machines for making—1635—J. Combe.
Distances, apparatus for ascertaining—1647—D. McCallum.
Drains and drain tiles—1608—W. P. Savage.
Engines, traction, &c.—1585—E. R. Turner and F. Turner.
Fabrics, machinery for producing knitted or looped—1592—W. Brown.
Fibrous substances, machinery for cleaning—1569—J. Holt.
Fire-arms—1645—A. Wyley and J. Grainger.
Fireworks—1655—W. E. Gedge.
Foot-lights for theatres, &c.—1643—C. Defries.
Forging machine—1549—I. Buckley and E. Crossley.
Frames for supporting threads, &c.—1590—W. H. Barwell.
Furnaces and boilers—1620—W. Clark.
Governors—1597—M. Henry.
Heating, &c., application of petroleum, &c., to—1599—B. F. Stevens.
Hydrostatic scales—1593—W. E. Newton.
India-rubber, vulcanising—1577—A. Turner and J. Clark.
Indicators for vehicles—1582—W. Adams.
Jib-sail rings—1629—R. Balans.
Kilns or ovens—1596—H. Chamberlain, J. Craven, & H. Wedekind.
Lamps, moderator—1611—W. Clark.
Lamps, paraffin—1580—J. Hinks and J. Hinks.
Land-cultivation, application of steam-power to—1626—W. Clark.
Leather, apparatus for shaving, &c.—1657—J. Lee.
Locks and keys—1679—A. B. B. Von Rathen.
Lozenges, manufacture of—1614—C. J. Tinker.
Meat, &c., preserving—1523—R. Jones.
Metal prepared by Bessemer's process, casting ingots of—1193—W. Weild.
Nuts, machinery for manufacture of—1628—R. A. Brooman.
Oakum, apparatus for manufacture of—1653—N. Jarvie & W. Miller.
Ornamenting wood and other surfaces—1583—W. Scarratt.
Oysters, apparatus for opening—1591—W. D. Napier.
Pottery, apparatus used in the manufacture of—1576—R. Cochran.
Printing machines—1555—W. Smith.
Pumps—1637—D. Gallafent.
Punches for making the eyes of needles—1528—G. Beard.
Railway carriages, &c., ventilating—1641—J. Langton.
Railway carriages and wheels—1671—J. E. Wilson.
Railway wheels and axles—1074—T. Cordukes and J. G. McGee.
Railways, permanent ways of—1673—J. E. Wilson.
Sails, apparatus for reefing, &c.—1639—T. Day, sen., and T. Day, jun.
Sewing machines—1609—W. F. Thomas.
Ships, machinery for loading—1598—W. E. Newton.
Spring hook or fastening—1575—W. G. Williams and J. Fraser.
Stamping, mechanism for varying letters or marks produced by—1595—J. Hay.
Stone-breaking, machinery for—1649—A. Thomas.
Telescopes, &c., stands for—1601—E. L. Berthon.
Thrashing machines, applying power to—1584—D. Crowe.
Tobacco, &c., packages for—1574—E. Francis.
Umbrellas, parasols, and sunshades—1625—T. Duffy.
Varnish—1618—J. A. Bouck and T. Hill.
Vessels, apparatus for steering—1665—R. K. Aitchison.
Voltaic apparatus for relief of hernia—1571—J. Tirat.
Washing and drying apparatus—1615—L. R. Bodmer.
Watches and time-pieces—1677—D. Tunks.
Water-closets, &c., apparatus for supplying water to—1616—T. Thomson and J. Murray.
Water-closets, portable—1622—J. H. Wilson.
Waterclosets and urinals—1627—M. L. J. Lavater and E. W. Niblett.
Yarns or threads, machinery for warping, &c.—1605—J. M. Johnson and J. Buckley.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Album—1676—W. E. Gedge.
Boot and shoes—1681—B. F. Sturtevant.

PATENTS SEALED.

134. W. H. Marks.
138. S. Wynn.
139. J. Thompson.
144. R. A. Brooman.
151. J. Hamer.
152. T. Lightfoot, G. P. Barnes, and J. Lightfoot.
163. E. T. Jarrold and G. J. Yates.
164. J. T. Hall.
166. C. Heptonstall & W. Lunn.
182. T. C. Clarkson.
195. R. A. Wright & E. Wright.
208. S. Moore.

From Commissioners of Patents Journal, July 19th.

PATENTS SEALED.

165. J. Burch and S. Fearnley.
171. H. C. Bagot.
174. J. Sewell.
190. D. Y. Stewart.
192. F. North.
196. J. Platt & W. Richardson.
199. J. E. Dix.
200. E. Lucius.
206. W. D. Grimshaw.
211. T. Bradford.
216. J. Stuttaford.
219. R. Martindale and J. Williams.
221. J. Combe and J. H. Smalpage.
231. S. Grafton.
234. W. T. Bury.
263. W. Clark.
299. J. Young.
333. J. Easton, jun., and T. Leigh.
413. R. Hornsby, J. Bonnall, and W. Astbury.
529. G. H. Ellis.
573. W. Clark.
723. J. Shepherd and J. Hoyle.
898. B. X. Richard and R. Radisson.
975. J. Stevens.
1294. W. Clark.
1403. W. E. Gedge.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1798. J. Mason.
1818. P. Shaw.
2076. G. F. Muntz.
1775. J. C. Coombe & J. Wright.
1777. B. Browne.
1781. W. Rigby.
1865. B. Brown and R. Hacking.
1779. J. H. Johnson.
1832. J. Platt.
1810. P. Williams.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1992. G. J. Wainwright and C. T. Bradbury.
1988. T. Roberts & J. Dale.
2003. W. E. Newton.

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CANTOR LECTURES.

"On Chemistry Applied to the Arts." By Dr. F. Crace Calvert, F.R.S., F.C.S.

Lecture IV.

Delivered on Thursday Evening, April 21st, 1864.

Animal Fatty Matters, the various processes for liberating them from the tissues in which they are contained. Their composition and conversion into soap. Composite candles. The refining of lard. *Cod-liver*, *sperm*, and other oils. *Spermaceti* and *wax*.

It will be quite out of the question for me to enter upon a general description of the properties and composition of fatty matters, as to do so would be to undertake far too wide a field of research. All that I can attempt in this lecture is to give an idea of their composition, and to describe some of their most recent applications to arts and manufactures.

The question of the source of the fatty matters in herbiverous animals has been the subject of a great number of scientific researches, but those of Baron Liebig, Dumas, Boussingault, Payen, and Milne Edwards, have left no doubt that when the food of an animal contains a sufficient amount of fatty matter, this is simply extracted from the food, and stored or consumed according to the animal's habits, that is to say, its consumption is in ratio to the activity of the animal; thus, an animal in a state of great activity is comparatively thin, but when confined in a pen or stall it quickly fattens. These gentlemen also proved that when the food is deficient in fatty matters a portion of the amylaceous or saccharine matter becomes converted into fatty matter. The most decisive experiments on this head were made by Mr. Milne Edwards, who found that when bees were confined under a glass shade, with no food but honey, they converted the greater portion of it into wax. Notwithstanding these proofs, however, chemists found it difficult to understand how substances so rich in oxygen as amylaceous ones became converted into a class of matters containing so little of that element, but Baron Liebig has recently published a paper which has partially solved this problem, showing that animals give off during respiration a larger amount of oxygen than is contained in the air inspired, which excess must be derived from certain organic substances circulating in the blood. Fatty matters may be classed under two heads, viz., vegetable and animal. The first are generally composed of a solid, called margarine, and a liquid, called oleine. The latter generally contains three substances, viz., two solids, stearine and margarine, and one liquid, oleine. I say generally, because there are exceptions; thus in palm oil palmetine is found, in linseed oil linoleine, in sperm oil spermaceti, and in waxes several peculiar acids. Let us now examine the composition of some of the most abundant fatty matters found in animals. The knowledge of the composition of these substances, of suet for example, was most unsatisfactory until 1811, when my learned and eminent master, M. Chevreul, published his elaborate researches, by which he demonstrated the real composition of fatty matters in general, and that they might be considered as real organic salts. Thus suet is composed of stearic, margaric, and oleic acids combined with the oxide of glyceryle. The three above-named acids he showed to be composed as follows:—

	Stearic acid.		Margaric acid.		Oleic acid.
Carbon	68	...	34	...	36
Hydrogen	66	...	33	...	33
Oxygen	5	...	3	...	3
Water	2	...	1	...	1

also that oxide of glyceryle, as it is liberated from the fatty acids, combines with water and forms glycerine. He further showed that when fatty matters were saponified, the change consisted in the substitution, for the oxide of glyceryle, of the oxide of sodium or soda in ordinary hard soaps, of the oxide of potassium and potash in soft soaps, of oxide of lime, baryta, or lead in insoluble soaps. You will easily conceive the pride of M. Chevreul when, forty years later, M. Berthelot effected the synthesis of the fatty matters, the analysis of which M Chevreul had published in 1811. This he accomplished by heating in sealed tubes, at a temperature of 520° for several hours, one, two, or three equivalents of each of the above acids with one equivalent of glycerine, leaving the mixture to cool, and then boiling it in a vessel with water and lime, when the excess of fatty acids not combined during the experiment were removed by the lime, leaving the neutral fatty matter, which was dissolved by ether, and thus obtained in a state of purity. By this interesting series of researches, M. Berthelot has not only reconstituted neutral fatty matters, but showed that the oxide of glyceryle was triatomic, that is, that one equivalent of the oxide would neutralise three equivalents of the acid, whilst it required three equivalents of soda to produce a neutral stearate with three equivalents of stearic acid.

Stearic acid, 3 ($C_{68}H_{66}O_5$), Glycerine, $C_6H_8O_6 - 4$ HO

Stearic acid, 3 ($C_{68}H_{66}O_5$) + 3 Soda NaO − 3 HO.

In fact the researches of this eminent chemist on the synthesis of organic substances have effected a complete revolution in the last few years in that branch of organic chemistry.

I shall now proceed to give you a rapid outline of the properties of these substances.

Stearic acid is a white crystalline substance, fusible at 158° F., soluble in alcohol and ether, insoluble in water, and saponified by alkalies.

Margaric acid is a solid crystalline substance, presenting the same properties as stearic, excepting that its fusing point is 140°.

Oleic acid is a fluid remaining in that state even at several degrees below the freezing point of water, and is also soluble in alcohol and ether, but not in water.

Glycerine, or the sweet principle of oils, was discovered in 1779, by Scheele, who extracted it in boiling oil of sweet almonds with oxide of lead, which, combining with the fatty acids, liberated the oxide of glyceryle, and this, in combining with water, formed glycerine. In consequence

of the numerous applications of glycerine in medicine, the French have manufactured this substance on a large scale from the liquors in which they have saponified their fatty matters into soap; but the purest and most extensive supply is furnished by Price's Patent Candle Company. In the course of this lecture I will give you a description of its preparation, as carried out at their works. Glycerine is a colourless, syrupy fluid, of sweet taste, and sp. gr. 1·28, highly soluble in water and alcohol, combining easily with hydrochloric, hydrobromic, benzoic, tartaric, &c., acids, forming neutral compounds. Diluted nitric acid converts it into glyceric acid; concentrated nitric acid into nitro-glycerine, or a substance exploding with violence by percussion, which has caused it to be proposed as a substitute for fulminating mercury, by its discoverer, Professor Sobrero. The application in medicine of glycerine has been greatly extended by its highly hygrometric properties. Thus, bandages moistened with glycerine remain constantly moist, because the glycerine attracts moisture from the air as fast as it is lost by evaporation. It has also been found eminently useful in diseases of the eye and ear. Glycerine boils at 527°, but when distilled is partly decomposed into a peculiar oily fluid, of a noxious odour, called acroleine. M. Bertholet has succeeded, by fermentation, in converting glycerine into alcohol. Again, Mr. George Wilson, F.R.S., the talented director of Price's Patent Candle Company, has applied glycerine with great success to the preservation of vegetable and animal substances. Another useful employment of glycerine is its substitution for water in gasometers, where the evaporation of the latter is a source of serious loss. Its addition to a soap solution increases the facility of forming soap bubbles to an extraordinary degree. In fact, by its aid, bubbles of seven or eight inches diameter can be produced, exhibiting most beautiful purple and green colours, the beauty of which is greatly enhanced, as Mr. Ladd will show you, when illuminated by the electric light. To prepare this peculiar soap solution the following proportions are stated to be employed:—Distilled water, 5 ounces; soap, $\frac{1}{8}$ of a dram; glycerine, 2 drams.

The extraction of the fatty matters of animals from the tissues enveloping them is a simple operation. The old process of doing this, technically called "rendering," consisted in introducing the suet into large iron pans and applying heat, which caused the fatty matters, by their expansion, to burst the cells confining them, and to rise to the top of the contents of the boiler, which were left to stand for a few hours, and the liquid fat was then run off. The organic tissues remaining with a certain amount of fat at the bottom of the boilers were removed, and subjected to pressure so as to separate the rest of the fat, the organic tissues remaining behind being sold under the name of scraps, for feedings dogs, &c. As this operation gives rise to noxious vapours, causing thereby great annoyance, other methods have been generally adopted. For instance Mr. D'Arcet's, the leading feature of which is, to place in a boiler say 350lbs. of suet with 150 of water and 15 of sulphuric acid, carrying the whole to the boil for some hours, when the sulphuric acid dissolves the organic matters and liberates the fatty ones, which are then easily separated from the aqueous fluid. Mr. Evrard's process appears preferable. He boils the fatty matters with a weak solution of alkali; or, in other words, he uses 300lbs. of suet with half a pound of caustic soda dissolved in 20 gallons of water, carrying the whole to the boil by means of a jet of steam. Under the influence of the alkali the tissues are swollen and dissolved and the fat liberated. By these operations a better quality of fat is obtained and no nuisance is created. It is found advantageous to purify or bleach the above fatty matters by the following means. Mr. Dawson's process consists in passing air through the melted tallow, and Mr. Watson's in heating melted fatty matter with permanganate of potash. Both these processes, as you will perceive, are based on the oxydation of the colouring organic matter. Some tallow melters further clarify their tallow by adding 5lbs. of alum in powder to 100lbs. of melted tallow, which separates and precipitates any colouring matter. The white snowy appearance of American lard, which is rather deceptive to the eye than profitable, is obtained by thoroughly mixing, by means of machinery, starch in a state of jelly with a little alum and lime, with the fatty matter, by which means two ends are attained, viz., the introduction of 25 per cent. of useless matter, and a perfect whiteness from the high state of division of the same. The fatty matters from fish are generally obtained by boiling those parts of the fish containing them with water, when the fatty matters rise to the surface of the fluid, and one whale has been known to yield as much as 100 tons of oil. According to M. Chevreul, the composition of whale oil is as follows:—

Solid fats......... { Margarine, Cetine,
Liquid fats ...... { Oleine, Phocénine,

together with a small amount of colouring matter, and of phocenic acid, which gives to whale oil its disagreeable colour and odour. Many attempts have been made to sweeten whale oil by the use of weak caustic lye, milk of lime, sulphuric acid, and steam; but although a great improvement has been effected, the oil is still recognizable by its unpleasant odour. I have no doubt in my mind, from experiments made by my friend Mr. Clift, that fish oils might be obtained as sweet as vegetable oils, if proper means for their extraction were adopted. Allow me here to revert to animal facts to show you that their comparative hardness or solidity, as shown by the following table, depends upon their relative proportions of stearine and margarine, or oleine:—

	Stearine or Magarine.	Oleine.	Melting point.
Ox tallow	75	25	111·0°
Mutton suet	74	26	109·0°
Hog's lard	38	62	80·5
Butter (summer)	40	60	86·2
Do. (winter).	63	57	79·7
Goose fat	32	68	79·0
Duck fat	28	72	77·0

M. Pelouze proved some years ago that the rancidity of ordinary animal as well as vegetable oils is due to a fermentation; that is to say, that under the influence of the azotised principle associated with all fats, the fatty matters split into their respective fatty acids and glycerine, which in their turn undergo a further change, resulting in the production of volatile fatty acids, such, for example in the case of butter, as butyric, caproic, capric, and caprolic acids; in the case of goat's milk, hirsic acid; of fish oil, phocenic acid. Further, M. Pelouze demonstrated, that in the case of olive oil this change occurred a few hours after the crushing of the berries, the oil thereby coming in contact with the albuminous principles or ferment.

I shall now have the pleasure of calling your attention to some of the special applications which fatty matters receive. The first of these arises out of the action of alkalies upon these substances, the result of which is the conversion of an insoluble matter (oil) into a soluble one (soap). I shall not enter into minute details of this well-known manufacture, but content myself with touching upon some of the most recent improvements. The usual mode of making soap is to add animal fats or vegetable oils to a weak lye, or caustic solution, carrying the mixture to the boil by means of steam-pipes passing through the vessel above a false bottom, and keeping the whole in constant agitation by means of machinery. During this operation the oxide of sodium replaces in the fatty matter the oxide of glycerylе, and when the lye is killed, that is to say when all its alkali is removed by the oil, a fresh or stronger lye is added, and these operations are repeated until the manufacturer considers that the matter is nearly saponified, which is easily judged of in practice. He then

proceeds with a second series of operations, called salting which have for their object to separate the glycerine and impurities from the soapy mass, and also to render the latter more firm and compact, in fact, to contract it. This is effected by treating it with stronger lye mixed with a certain quantity of common salt, and allowing it to stand for a few hours, so that the mass of soap may separate from the fluid containing glycerine and other impurities. When the second series of operations are finished the clarifying or finishing process follows: this requires the use of still stronger lye and salt, which not only complete the saponification, but separate any remaining impurities; the semifluid mass of soap is then allowed to stand for twelve hours, when the soap is either run or ladled into large wooden moulds, and allowed to stand until quite cold. After standing for a day or so, the wooden frame is removed from the solid mass of soap, when it is divided into bars by means of a brass wire. The difference between *white curd* and *mottled* soap is caused by the addition to the fluid mass of soap of about four ounces of alum and green copperas to every 100 lbs. of soap, which gives rise to an alumina and ferruginous soap, which on being diffused through the mass by means of agitation, mottles or marbles the mass when cool. When well prepared this is the most economical soap, as no large quantity of water can be introduced to weight it, because this would cause the separation of the mottling material from the soap. *Fancy soaps* are prepared in the above manner, by the employment of a better quality of materials and the addition of various perfumes. *Rosin or yellow soap*, as its name implies, is one in which a portion of the fatty matters is replaced by rosin, which is added to the soap paste when there is but little aqueous solution of alkali left to dissolve it, so that the rosin can at once enter into the composition of the soap, instead of being dissolved in the alkaline lye and lost. Rosin soaps, nearly white, are now manufactured, owing to the discovery of Messrs. Hunt and Pochin, who have succeeded in obtaining nearly white rosins by distilling common rosin with the aid of superheated steam. *Silicated soaps* are much used in America, owing to their cheapness, which is due to the introduction of a certain amount of silicate of soda. *Transparent soap*, the method of making which was so long kept secret, is now known to be obtained by dissolving soap in alcohol and allowing a concentrated solution of it to cool slowly, when it is poured into moulds and allowed to solidify. One of the most useful and recent improvements in soap-making is that which enables the manufacturer to produce what is called *glycerine soap*, which is characterised by the retention of the glycerine of the fatty matter. Its manufacture only occupies a few hours, instead of several days, as is the case with ordinary soap. It is prepared by employing 63 parts of fatty matter, 33 of water, and 5 of alkali, which are heated to a temperature of between 350° and 400°, for two or three hours, when the mass is entirely saponified, and then has only to run into moulds to be ready for the market. But the most important discovery connected with the saponification of fatty matters by means of alkali is that recently made by M. Mèges Mouries, for this gentleman has arrived at the remarkable result of saponifying fatty matter in the space of 12 hours, and, what is more extraordinary still, at natural temperatures. If we connect this fact with the one that caustic soda is now manufactured by tons, it appears highly probable that in a few years the fatty matters of Brazil and Monte Video, instead of being sent to this country as such, will be converted into soap there, and imported thence by us in that form. M. Mouries has discovered the fact that fatty matters are susceptible, under peculiar circumstances, of being brought into a globular state, and that when in that state they present new and peculiar properties. Thus, for example, fatty matters, when kept in a damp state, usually become rapidly rancid, whilst when in the globular state they may be kept for a very long period without undergoing that change. This peculiar state can be imparted to fatty matters by melting them at 113° and adding a small quantity of yolk of egg, bile, albuminous substances, or, what is best, a solution of alkali, composed of five to ten parts of alkali for every 100 parts of oil, at the same temperature, agitating the whole for some time to bring the fatty matter into a globular condition. If at this stage the action of the alkali is continued and the temperature is raised to 140°, it is found that instead of the fatty matters requiring a long time to saponify (as is usual even at a temperature of 212°) the saponification is most rapid, because each globule of fatty matter offers an immense surface to the action of the alkali, and it is found that in two or three hours the whole of the fatty matters are converted into soap. In fact saponification is so perfect that the mass of soap dissolves completely in water; and if the purpose is to liberate the fatty acids, this can be done at once by the addition of a little vitriol. The fatty acids produced by this comparatively cold saponification are so pure that when subjected to pressure the solid fatty acids have not the slightest odour and fuse at the point of 138°. As to the oleic acid prepared by this process, instead of being brown (as is usual with the commercial acid) it is colourless, and can be employed in manufacturing soap of good quality. When M. Mouries desires to make soap with the entire fatty matter, he acts at once upon the globular fatty mass, by adding salt, which separates the soap from the aqueous fluid; it is then melted and run into moulds. Whilst speaking of the mode in which alkalies can be made to act upon fatty matters, I ought to state that M. Pelouze observed the curious fact that large quantities of fatty matters could be split into their respective elements, viz., fatty acids and glycerine, by heating them for some hours with a small quantity of soap. This discovery of his, as we shall presently see, has been taken advantage of in the manufacture of stearic candles.

Permit me to state that *soft soaps* differ from hard soaps mainly in the substitution of potash for soda, and in the omission of the salting and clarifying processes, so that the soapy mass is not separated from the excess of water, and therefore after the fatty matter has been saponified by the alkali, the whole is evaporated to the required consistency. I cannot conclude better this hasty and imperfect sketch of the soap manufacture than by the following table of compositions, showing the per centages of the various elements in the following soaps:—

Names of Soaps.	Fatty acids.	Alkali.	Water.
Curd	62	6·0	32·0
Marseilles	60	6·0	34·0
White	60	6·4	33·6
White cocoa	22	4·5	73·5
Yellow rosin	70	6·5	23·5
Calico printers	60	5·2	34·8
Silk boiling	57	7·0	36·0
Wool scouring	55	9·0	36·0
Soft	43	10·0	47·0
Theoretical	63	6·4	30·6

As it is easy to introduce into soaps a much larger quantity of water than they should contain to render their employment economical, it behoves those who use large quantities in their manufacture to ascertain the extent of the moisture contained in soaps. This may be pretty accurately approximated to by placing a quarter of an ounce, divided into thin shreds, upon a hob or other warm situation, and leaving it for several days, when it will lose nearly the whole of the water it originally contained, or about a third of its weight if it does not contain an undue proportion. In many instances the proportions of alkali in soap may seriously affect its applicability. Thus I ascertained a few years since that the quality of soap best adapted to clear madder purples should not contain more than 5 per cent. of alkali, whilst for pinks, where it is necessary to remove any loose colour which the mordants

may have mechanically retained, a more active soap is required, viz., one containing from 6 to 7 per cent. of alkali.

I have now to draw your attention to a totally different kind of manufacture, viz., that of composite, stearic, and Belmont candles. Many years elapsed between the scientific discovery by M. Chevreul of margaric and stearic acids, and their application to illuminating purposes, for it was early in 1825 that MM. Chevreul and Gay-Lussac took out a patent with a view of realising this advantage. But it was reserved for a manufacturer, M. de Milly, to perfect the manufacturing details of the processes, and to render these candles a marketable commodity. This he effected by also improving the manufacture of the wicks, and he was the first to introduce this article to the trade in 1832, under the name of *bougies de l'etoile*. Let me give you an idea of his *modus operandi.* 100 lbs. of tallow, 17 lbs. of lime previously slacked, and 1000 lbs. of water were placed in a large iron boiler, and kept at the boil for several hours by means of a jet of steam. The result was that the glycerine dissolved in the water, whilst the fatty acids united with the lime. The insoluble stearate, oleate, and margarate of lime were then decomposed by weak vitriol, under the influence of heat. Insoluble sulphate of lime was produced, and the fatty acids liberated. These, in their turn, were submitted to hot and cold pressure, which liberated the oleic acid, leaving the solid stearic and margaric acids behind; it was then only necessary to cast them into moulds containing wicks, and the *bougies de l'etoile* were produced. MM. de Milly and Motard have introduced, of late years, several important improvements into this branch of manufacture, the most important of which is that of operating under pressure, by which means they succeed in decomposing the fatty matters with 3 or 4 per cent. of lime instead of 17, this of course involving the saving of a large quantity of vitriol. M. Bouis has made a further improvement, by adding to stearic candles 3 or 4 per cent. of sebasic acid, which is extracted from castor oil, and has the high fusing point of 261°. M. Chevreul also suggested a simple method of increasing the whiteness of these candles, by the addition of a small quantity of ultramarine blue to neutralise the slightly yellow tint of the manufactured acid. One of the greatest improvements in the manufacture of these candles is that carried out by Price's Candle Company; but before describing to you this beautiful process, as adopted by Mr. G. F. Wilson, at this company's works, allow me to state a few facts. Up to 1840 the best kind of candles were those made of spermaceti or of animal fatty matters which were cold and hot pressed. In that year Mr. Wilson, whilst experimenting with the view of making candles which would not require snuffing, for the illumination on the occasion of Her Majesty's marriage, discovered that a combination of cocoanut stearine with stearic acid would make candles giving a beautiful light, and free from the necessity of snuffing. These he called "composite," and they were soon largely sold. In 1838 Mr. Fremy published his interesting discoveries, showing that when oils or fatty matters were mixed with 20 or 30 per cent of concentrated sulphuric acid, the fatty matters were split, or, as he calls it, saponified, and that sulpho-margaric, sulpho-stearic, sulpho-oleic, and sulpho-glyceric acids were formed. He further observed that boiling water decomposed the sulpho-stearic and margaric acids, and only partially the sulpho-oleic into stearic, margaric, oleic, and sulphuric acids, which last acid remains in the water together with the sulpho-glyceric acid and that portion of the sulpho-oleic acid not decomposed, the other acids remaining insoluble and floating on the surface. In 1842 Messrs. G. Price and Jones secured a patent to carry out on a practical scale the scientific discoveries of M. Fremy. In that patent two or three important facts are brought out; first, that if instead of operating at a low temperature, as recommended by Fremy, heat was employed, the action of the sulphuric acid on the organic compounds would give rise to sulphurous acid, which they discovered had the remarkable property of converting the liquid oleic acid into a solid acid called "elaidic," thus largely increasing the yield of solid fatty acids. Their mode of operating was this—10 or 12 per cent. of concentrated sulphuric acid was added to the fatty matters which had been previously liquefied by heat, and the whole was kept at a temperature of 200° for 24 hours. During that time the fatty matters were split into their primitive elements, and the oleic acid was converted into elaidic acid. The whole was then repeatedly treated with boiling water. to dissolve the sulpho-glyceric acid and other impurities, leaving the solid fats ready for distillation. Mr. G. F. Wilson has since then greatly improved this part of his manufacture, as the beautiful candles, everywhere to be seen, will amply prove. The most important improvement in a chemical point of view is the following:—He has found, for example, that fatty matters are split up into their component parts, by decreasing quantities of vitriol, as the temperature used is increased. Thus, at a temperature of 200°, 15 parts of vitriol are required; at 350°, 6 parts; at 500°, 1 part. Further, by employing this small proportion of sulphuric acid, not only is the expense of washing the fatty matters after their saponification by the acid avoided, but the distillation may be proceeded with in the same vessel. The distillation of fatty matters, first performed by Mr. Wilson, and since carried by him to a state of perfection, is based on the fact that, whilst fatty matters, if distilled by direct heat, are completely decomposed, giving rise to the noxious vapours of acroleine, from the destruction of the glycerine, &c., this evil is completely avoided in distilling them by passing a current of superheated steam at a temperature of between 550° and 600° through the mass of melted fatty matters previously brought to the same temperature. By this means the glycerine passes first without decomposition, and is then followed by the fatty acids. In fact, the distillation proceeds with such rapidity and regularity that a stranger might witness the distillation of 1,000 gallons in 24 or 36 hours, and all the time would probably suppose that water only was distilling. The results are so perfect, that the Jury at the Paris Exhibition of 1855 could hardly credit their genuineness, and actually deputed Mr. Warren de la Rue to come from Paris to verify the fact that the beautiful products exhibited were obtained in many instances from very inferior kinds of fat. The glycerine only requires redistillation to be fit for all the purposes to which it is applied. As to the acids, they are submitted to an intense cold pressure, which separates the oleic acid from the stearic, margaric, or palmitic acids. These are melted, and when near the point of solidification, the vessel containing them is run on rails over the moulds, which are so arranged that each frame contains 200 separate moulds, in which already the wicks, prepared with borax or a salt of ammonia, are fixed. The only remaining operation is to fill the moulds and allow the candles to cool.

Oleic acid has recently been made available for several valuable purposes; it has been largely employed in the manufacture of soap; but its most important application as yet is its use on the continent, and recently in England, as a substitute for olive oil in the greasing of wool for spinning, the advantages of which are marked, as its removal by alkalies in the scouring process is much easier, and its price lower. Messrs. Laing and Wilson have recently taken out a patent for the employment of oleate of ammonia as a mordant; and, as the specimens which I have the pleasure to show you illustrate, it increases in a marked manner the beauty and brilliancy of the coal-tar colours on cotton.

It now only remains for me to refer to another interesting process for splitting fatty matters into their elements, I mean that of Mr. Tilghman, which consists in mixing fatty matters with one-third to one-half of their

bulk of water, and placing them in a vessel capable of resisting a very high pressure. There they are submitted to a temperature of between 550° and 600° Fahr., and under the influence of that heat and pressure the fatty matters are decomposed into glycerine and fatty acids. M. Tilghman has also adapted an apparatus which enables him, by means of coils of tubes to keep up a constant stream of fatty matters and water through the tubes surrounded by fire, by which means the decomposition is rapidly and continuously carried on. I must not, however, conclude this part of my lecture without drawing your attention to these beautiful specimens illustrating the manufacture of Messrs. Price and Co., kindly lent to me by Mr. G. F. Wilson.

Spermaceti.—This valuable substance is found in large quantities in the bony receptacles of the head of the white whale of the South Seas, and as it is there mixed with a fluid substance called sperm oil, these are separated by means of filtration. The solid mass which is thereby left in the linen bags is first pressed cold, and then between heated plates (hot-pressed). It is then physicked or heated in a boiler with a solution of caustic potash of sp. gr. 1·45, which dissolves a small amount of oily matter, still adhering to the spermaceti, and this, after being well washed, is run into moulds to cool. The manufacture of spermaceti candles requires great care and practical experience. The only fact I shall mention is, that about 3 per cent. of wax is added to spermaceti to prevent the mass being too crystalline or brittle. M. Chevreul, who chemically examined pure spermaceti, or cetine, at the beginning of this century, succeeded in unfolding it into an acid, which he called ethalic acid, very similar to palmitic, and into a neutral substance called ethal, the composition of which he prognosticated would be found to contain pure alcohol. This, I am pleased to say, has proved to be the case, for its composition can be considered as represented by—

$$C_{32}\,H_{33}\,O_3 + HO.$$

Mr. Heintz has recently published a very elaborate paper on the composition of this substance, and states that spermaceti contains the following components:—

			Ethal or oxide of cetyle.
Stearophanate	$C_{36}\,H_{35}\,O_3$	...	$C_{32}\,H_{33}\,O_3$
Margarate............	$C_{34}\,H_{33}\,O_3$	...	,,
Palmitate............	$C_{32}\,H_{31}\,O_3$	...	,,
Cetate	$C_{30}\,H_{29}\,O_3$	...	,,
Myristate	$C_{28}\,H_{27}\,O_3$	...	,,
Create	$C_{26}\,H_{25}\,O_3$	...	,,

It appears to me that several of these products do not exist ready formed in spermaceti, but are the results of chemical reactions.

Bees' Wax.—I have already had the pleasure, at the commencement of this lecture, of drawing your attention to the fact that bees either gather wax from the flowers on which they alight, or are capable of producing it direct from saccharine matters. The wax as it is obtained from the honeycomb being coloured it is necessary to bleach it for most of the applications which wax receives. The old process (still followed in many parts of Europe) consists in melting wax in water and allowing it to run into a second vessel so as to separate it as completely as possible from its impurities. When cooled to nearly its melting point, it is allowed to fall on rollers which revolve in cold water, by which means thin ribbons of wax are obtained, which are then placed on meadows to bleach under the influence of the atmosphere. The above operations are repeated until the wax is perfectly bleached. This plan is so tedious and expensive that several chemical processes have been proposed. Mr. Casseraud's is to pass steam through the melted mass, which is at the same time subjected to the influence of sun light. Mr. Solly's is to treat the melted wax by a mixture of nitrate of soda and sulphuric acid, when the nitric acid liberated oxidises and destroys the colouring matters of the wax. Pure wax melts at 149°, and, when treated with alcohol, is found to be composed of—

Cerine or Cerotic acid...	$C_{54}\,H_{53}\,O_3\,HO$	... 65
Myrieine	$C_{92}\,H_{92}\,O_4$	... 30
Ceroleine		... 5
		100

Sir Benjamin Brodie, who examined most minutely the chemical composition of a great variety of waxes, considers that the substance called by chemists cerine is really cerotic acid, and that myricine is a compound of palmitic acid and melissine. The lecturer here illustrated and explained the various adulterations of wax, giving the means of detecting them. The adulterations were common owing to its value.

Chinese Wax is a compact substance, imported from China and said to be secreted by an insect called *Coccus Pela sinensis.* This wax, which is harder and more brittle than bee's wax, melts at 181°, and has yielded, in the hand of the above eminent chemist, cerotic acid and cerotine or oxide of cerotyle.

Proceedings of Institutions.

BARNSLEY MECHANICS' INSTITUTE.—The Committee are grieved to report the resignation of the President, William Harvey, Esq., in consequence of his impaired state of health. The library now contains 2,190 volumes, of which 253 have been purchased at a cost of £22 1s. 8d., and 35 volumes have been given by friends of the Institute, thus making a total addition of 288 volumes during the year. The lectures have been very costly during the session, entailing an expenditure of £61 1s. 10d., an average of £5 upon each. In proportion as the members and public have appreciated the Committee's efforts to provide lectures of the best class, so has it been their desire still further to enhance the value of these entertainments. Among the lectures delivered may be mentioned one on "The study of Biography, as an aid to the work of Self-culture and the Formation of Character," by Mrs. C. L. Balfour; a dramatic reading of "The Love Chase," by Miss Kate Hickson, of the Scarbro' Theatre; one on "David Copperfield," by George Grossmith, Esq., of London; one on "Ill-used Men," by George Dawson, Esq., M.A.; one on "Albert the Good," by John De Fraine, Esq., of London. A large sum of money has been spent in the purchase of books, but the loss upon the hall account has now reached the sum of £34 16s. 9d., being more than £29 in excess of that experienced in the previous year. The lettings of the hall have only realised £25 2s., whereas in the former year they amounted to £47 6s. The balance sheet shows that the receipts have amounted to £182 3s. 6d., and there is a balance in the Bank of £31 3s.

WIGAN MECHANICS' INSTITUTION.—The tenth annual report says that although the receipts have not been equal to the expenses, considering the badness of the times there is cause for gratification at the balance remaining at the end of the year. This year voluntary donations have not been received, as was the case last year, to the amount of £28 4s. 3d. The Directors are sorry that last winter there was no inducement for them to open the evening school, this arising wholly from the fact that not more than six applications were made to join it. This can only be accounted for by the apathy of those whom the school is intended to benefit, or from the number of private evening schools now at work in the town and neighbourhood. A series of lectures was arranged to be given for the benefit of the Institution and its members, but the way in which two of the lectures were attended was far from encouraging. At the public readings the attendance and the receipts have been satisfactory. The guarantee fund against loss, given by the late Robert Laing, Esq., still remains untouched. The average number of mem-

bers paying a guinea per annum was 77; of other classes of members 249; total 326—a slight increase upon the preceding year. The library return for the year exhibits a much healthier tone of reading on the whole than for some time back, and shows an increase in the number of volumes taken out (amounting to 745) as compared with last year. The total number of books taken out in 1863 was 7,829 as against 7,084 in 1862. The expenditure amounted to £462 13s. 11d., and there is a balance against the Institution of £28 10s. 1½d.

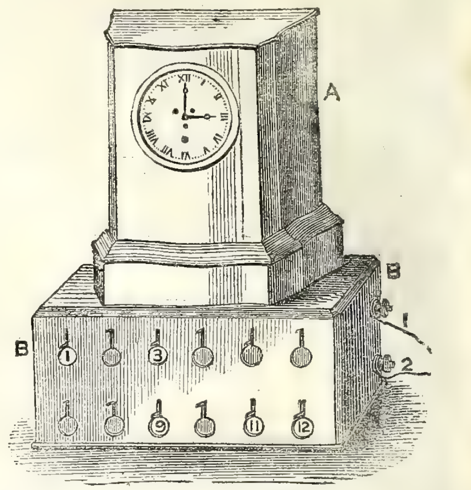
SMITH'S ELECTRIC TELL-TALE.

The ordinary tell-tale or "pin" clock, is well known for recording the vigilance of a watchman, but it can do no more than show that at a particular time the watchman was at one portion of the building. It certainly cannot inform the master whether or not the man has gone his nightly rounds as he ought. That he has been watchful and attentive at any one hour is all that one clock can prove, and the employment of two or more is rather too costly to admit of their general adoption. The accompanying engravings give an external elevation of a simple and ingenious tell-tale, invented by Mr. A.W. Willoughby Smith, and manufactured by Mr. Sax, of 108, Great Russell street, Bedford-square. The principle of its action is simply this: Suppose that in different parts of a large establishment, instead of expensive clocks, a number of old-fashioned hour glasses were placed; suppose, further, that the watchman in going his rounds should turn all these glasses during his walk at the specified period. It is obvious that, if any means could be devised by which the turning of each glass before it was run could be registered, all the purposes of the best watchman's clock would be fulfilled. This registration is exactly what Messrs. Smith and Sax effect, and the registration takes places in the head office of the firm, or any other place where it is a matter of impossibility that any tampering with the record can take place.

In each room through which the watchman has to pass in the course of his rounds is placed a small box, enclosing an hour glass, suspended on an axis through its centre, as in Fig. 2, and the watchman, by means of a key, can turn this glass over, when the sand at once begins to run. A wire connected with a clock and apparatus, Fig. 1, placed in the chief office, or other safe situation, runs from box to box, and is finally joined to one pole of a galvanic battery, the other pole of the battery being connected directly with the clock. The arrangments are such that the watchman by turning over the hour glasses establishes metallic connection all along the circuit, leaving the last connection to be completed by the clock when the hand arrives at the specified hour.

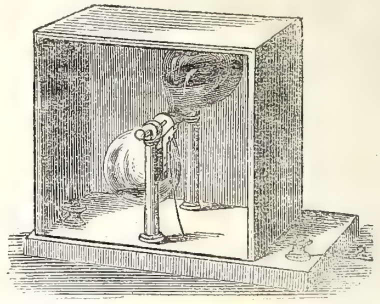
Beneath the clock is placed a stand or base, B, fig. 1, in the lower part of which are twelve apertures corresponding to the hours, marked on the dial above. In each of these is placed a small German-silver slide, marked 1, 5, 10, &c., up to 12. The clock is placed in the master's private office, and the operation is as follows:—As soon as the clock completes the circuit (which it can only do when all the hour glasses are standing as set by the watchman) a temporary magnet is formed which causes one of the labels to drop into view as the hour-hand of the clock reaches each figure on the dial; but as the circuit cannot be completed by the clock unless the hour-glasses, which are shut up in locked boxes, are turned regularly, the neglect of any one hour is registered by the non-descent of the corresponding label. It matters not if out of 20 glasses 19 are in contact. The failure of the 20th is inevitably registered. The sand in the glasses is adjusted to run out in a given period, say half an hour, or such length of time as will enable the watchman to make his round and turn each hour-glass, and admit of the clock reaching the given hour before the sand has run out, and the glasses overturned, by change in the position of

Fig. 1.



their centre of gravity, thus breaking the continuity of circuit.

Fig. 2.



If the wires are tampered with, a bell is set ringing in the office, until attention is attracted and the wires set right.

When desirable, alarums can be rung at various hours, or at the same hour in many different rooms by the same clock. Thus, if need be, an entire village of factory operatives might be aroused betimes. It is evident that this electrical tell-tale is applicable to a vast number of purposes. It can be used on board ship; at railway stations it can report the vigilance of outlying signal men. In fire-engine stations, breweries, factories, mills, docks, or warehouses, it appears likely to prove equally suitable.

EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 591.)

NAVIGATION AND NAUTICAL ASTRONOMY.

THREE HOURS ALLOWED.

I.

1. Prove that the sum of the angles of a spherical triangle is greater than two and less than six right angles: also, if A B C be the angles of a spherical triangle, $A + B - C < \pi$

2. Express the Cosine of an angle of a spherical triangle in terms of the sines and cosines of the sides, and deduce the formula,

$$\text{Cot. } a \text{ Sin. } b = \text{Cos. } b \text{ Cos. C} + \text{Sin. C Cot. A.}$$

3. What is meant by the Spherical Excess? In any right-angled triangle of which C is the right angle and E the spherical excess,

Prove that—

$$\frac{\text{Sin.}^2\, c}{\text{Cos.}\, c}\ \text{Cos. E} = \frac{\text{Sin.}^2\, a}{\text{Cos.}\, a} + \frac{\text{Sin.}^2\, b}{\text{Cos.}\, b}$$

II.

1. Having giving two sides and the angle opposite to one of them in a spherical triangle, to find the remaining parts, and explain the ambiguity in this case.

2. Shew how to reduce an angle to the horizon.

3. Find the angular radius of the circle which touches three sides of a given triangle in terms of its sides or angles.

III.

1. February 18th, 1864, the observed meridian altitude of Canopus under the South Pole, was 33° 20′ 30″. Index error — 1′ 40″, and the height of the eye 19 feet. Required the latitude.

2. September 18, 1864, at 5h. 51m. A.M., nearly in latitude 47° 25′ N., longitude 120° 30′ W., the sun rose by compass E. 12° 10′ S., the ship's head being E. Required the variation of the compass. The deviation is 8° 50′ E.

IV.

1. Prove that—

$$\frac{\text{Diff. latitude.}}{\text{Mer. diff. lat.}} = \text{Cos. Mid latitude.}$$

2. In Great Circle sailing show how to find the distance in a great circle between the places whose latitudes and longitudes are given.

3. Prove the rule for computing meridional parts.

V.

1. Required the compass course and distance from A to B:—

Lat. A 45° 20′ N. Variation 2 Pts. E., lon. A 3° 10′ E.
,, B 39° 30′ N. Deviation 7° W. ,, B 2° 20′ W.

2. Sailed from a place A, due West, 471·5 miles, to a place B. Required the latitude and longitude B.

Lat. A = 50° 20′ N., lon. A = 5° 18′ W.

3. A ship having sailed N.E. by E. from a port in latitude 42° 18′ N., met a sloop which had sailed from a port in the same latitude, lying 92 miles to the east of the ship's port; the sum of their distances made is 159 miles. Required their respective courses and distances.

VI.

1. What is meant by *equation of time?* and explain the causes which affect its nature and amount. What is meant by the hour angle of a heavenly body?

Also find the hour angle of a heavenly body east of the meridian, given the latitude 47° 38′ 10″ N., the declination = 13° 25′ 33″ S., and the altitude 50° 16′ 34″; and construct the figure.

2. May 16, 1864, at 6 A.M., nearly in latitude 42° 37′ N., lon. 115° 30′ W., the obs. alt. of sun's L.L. p. artificial horizon, was 27° 55′ 15″. Index error + 3′ 12″. The chronometer showed 2h. 8m. 50.5s. Required the error of the chronometer or Greenwich meantime.

VII.

1. Investigate a method of finding the latitude and longitude by means of two altitudes of a heavenly body and the run between.

2. Describe and prove Sumner's method of finding the latitude and longitude by a double altitude of the sun.

3. The distance of a heavenly body from the moon being observed, and their altitudes show how to find the true distance and the longitude of the place of observation.

VIII.

1. Explain the mariner's compass. Show to what several sources of error it is liable, and how these may be corrected.

2. Explain fully how azimuths of a heavenly body are observed.

3. What is meant by a cyclone? What is the difference between a cyclone in the northern and southern hemisphere? Show how to find the bearing of the centre of a circular storm.

PRINCIPLES OF MECHANICS.

THREE HOURS ALLOWED.

1. What are the principal properties of matter?

2. Three forces act on a material particle in directions at right angles to each other: it is required to find the magnitude and direction of their resultant.

Ex: Let the forces be denoted by 6, 9, 10; what are the direction and magnitude of the resultant?

3. Define the centre of gravity of a heavy body, and prove that if a body be suspended from a point about which it can swing freely, it will rest with its centre of gravity in a vertical line through the point of suspension.

Where is the centre of gravity of a triangle of which each side is a foot long?

Two spheres, whose radii are 8 and 10 inches, touch one another: determine the distance of the centre of gravity from the centre of the smaller sphere, when the former is of copper and the latter of iron.

(Sp. G. of copper = 8·788 : Sp. G. of iron 7·207.)

4. What are the two requisites for a good balance? Show how they can be obtained. Which of the two requisites is the more necessary for rough work, and which for delicate weighing?

5. A body is thrown vertically upward with a given velocity: investigate the formulæ for the space described in a given time.

Ex. Let the upward velocity of projection be 100 feet: how high will the body have risen in three seconds? How high altogether? How long will it be before it returns to the starting point?

6. What are the laws of impact of two bodies, whether elastic or inelastic? If two inelastic bodies impinge upon one another, determine their common velocity after impact.

A, weighing 2 lbs., and moving with a velocity of 20 feet per second, overtakes B, weighing 5 lbs., and moving with a velocity of 5 feet per second: determine the common velocity after impact.

If A and B be each perfectly elastic, determine their separate motions after impact.

7. Prove that the curve described by a projectile in vacuo is a parabola.

There is a wall 20 feet high: from a point 16 feet on one side of the base a body is thrown so as just to clear the wall, and to fall 30 feet on the other side of the base: with what force, and in what direction, must the ball have been sent?

8. A heavy body moves in a circle with uniform velocity: find the central force necessary to keep it in the circle.

A locomotive engine, weighing 9 tons, passes round a curve 1,200 yards in radius at the rate of 20 miles an hour: what is the pressure tending away from the centre of the curve?

9. What is the "radius of gyration" of a body round a fixed axis? Find that of a fly-wheel, the inner and outer diameters of whose rim are 15 and 16 feet respectively, around its shaft.

10. State and prove the amount of pressure of a fluid on a surface containing it.

Ex. 1. Find that on the surface of a sphere of 10 inches radius filled with water.

Ex. 2. A reservoir has a bank whose inner slope is 90 feet by 100 yards; when full the depth of water is 80 feet: find the pressure on the embankment, and where the direction of the resultant acts.

11. How is sound produced? What are the experimental facts ascertained with regard to the waves of sound?

12. Explain the action and the defects of the wheel barometer.

13. Describe and explain the facts of capillary attraction; and prove that the form of a fluid, ascending between two vertical plates slightly inclined, is a hyperbola.

(*To be continued.*)

Manufactures.

Wolframed Pig Iron.—The *Colliery Guardian* gives an account of some experiments made by M. Le Guen with reference to the advantages derived from a mixture of wolfram with iron. The experiments took place at the military port of Brest, and the pig tested, which comprised both new and old specimens in proportions adapted to give them a great resistance, acquired a new degree of strength by an addition of less than 2 per cent. of wolfram. One description of pig which was experimented upon was formed of equal parts of new English pig, Yféra-anth, and old speckled pig, and the augmentation of resistance to a rupture, after the addition of French wolfram, was 44½ kilogrammes per square centimetre. A kilogramme is the fiftieth part of an English cwt.; and a centimetre is the hundredth part of a metre, or about four-tenths of an English inch. In another description of pig, formed of one-third of the same English pig and two-thirds of the fragments of old cannons, the augmentation of resistance with German wolfram, put in in the same proportion, was about 68 kilogrammes per square centimetre. On being submitted to a second fusion, the wolframed pig still preserved its superiority over corresponding ordinary pig. After this operation, the difference in favour of the first pig with wolfram was 26¼ kilogrammes, rather less than in the first instance; but the difference in favour of the second description was 69 kilogrammes and a fraction. Thus the efficacy of the German wolfram, already greater at the first fusion than that of the French wolfram, still remained superior to it in the second fusion. A third fusion of the same pig having been effected—this time directly in a Wilkinson's furnace, instead of in a melting pot or crucible, as formerly—the tenacity of the wolframed pig again exceeded that of the corresponding pig. It may be concluded from this that the action of the wolfram continues when the fusion is taking place directly in a furnace, and that it is maintained after several successive fusions. In wolframed pig, composed of Yféra-anth and fragments of old cannons, resistance to rupture after the second fusion exceeded, by nearly one-third, that of ordinary corresponding pig. The resistance of the same pig after the first fusion exceeded, by 20¾ kilogrammes per square centimetre, that of the most tenacious pig dealt with formerly in the foundry of the port of Brest; and after a second fusion it exceeded by 42 kilogrammes. It is sufficient that the wolfram should be pulverised but not reduced. The French mineral is, however, roasted besides, so as to free it as much as possible from the sulphur and arsenic which it contains. As to the German wolfram it was simply pulverised in the experiments at Brest, and it had not undergone any preparation, being probably more pure. The reduction is effected in the midst of the liquid mass, at the expense of the carbon of the pig.

African Exhibition.—In the month of December next there will be held, at Freetown, Sierra Leone, an exhibition of native art manufacture, agriculture, live stock, and produce; with departments for European and other foreign exhibitors. The project enjoys the patronage of the Governor-in-Chief, Major Blackall, who is also the president; the Governor of Gambia, Colonel D'Arcy, Commodore Wilmot, members of the Legislative Council, and so forth. Contributions and assistance from England are desired, and arrangements for the free conveyance of goods to and from the place of exhibition will be made with the African Mail Steam-ship Company. In the meantime subscriptions in aid of a movement so eminently calculated to stimulate the producing powers of the colony will be received at the London and Westminster Bank, St. James's-square.

Bisulphate of Carbon.—M. Deiss, one of the largest manufacturers of bisulphate of carbon in France, has invented an apparatus containing hydrate of lime, which absorbs the waste sulphuretted hydrogen given off during the process. At the suggestion of M. Payen, M. Deiss has substituted for the lime sesquioxide of iron mixed with sawdust. The products resulting are water and sulphur, the latter being recovered by simple washing with bisulphide of carbon and subsequent distillation. The oxide of iron is then calcined, and is once more ready for use. The idea has, of course, been taken from the method of gas purification, now adopted by many companies, but the application is new.

Commerce.

Culture of Cotton in Algeria.—Great efforts have been and are still being made to establish the cultivation of cotton firmly in Algeria, and a report lately published on the success that has been obtained in the province of Oran speaks of the results in highly satisfactory terms. The number of persons engaged in growing cotton is stated at 557, and the extent of the plantations at about 6,332 acres, of which all, with the exception of 187 acres, are planted with long Georgian cotton. The average yield of this kind is set down at more than 531 kilogrammes per hectare, or over 500lbs. English per acre, while in many places the yield has been as high as 700 kilogrammes. The short fibre cotton yielded only 427 kilogrammes per hectare. The total crop of cotton, uncleaned, was 1,338,103 kilogrammes, or 1317 tons English. This shows an increase of two-thirds over the year 1862. The yield of the cotton after cleaning is stated to be 25 per cent. The amount exported, and on which the government premium was paid, is stated to have been 3,193 bales, giving a total of about 312 tons. The report recognises great improvement, not only as regards the cultivation but also in the preparation of the cotton, the ginning, and the making up of the bales. The sorting, however, is spoken of as much less satisfactory. The reporters express their opinion that in a few years the average yield of 600 kilogrammes per hectare will be attained, and perhaps surpassed. As regards the price of cotton in France, to the 15th of May, the average, at Marseilles, was 1025 fr. the 100 kilogrammes (about 3s. 2d. per lb. English); at Havre, 1080 fr.; at Lille, 1040 fr.; and at Mulhouse, 978 fr. The Chambers of Council of these four towns have been consulted on the probabilities of the maintenance of the price, and their answers are as follows: The Marseilles Chamber is of opinion that there is no hope of such prices being obtained; that of Havre, that there is every reason to suppose that the present prices will be maintained without sensible variation, unless unforeseen circumstances arise; Mulhouse thinks that the price of Algerian cotton has already begun to waver, that it is now 9fr. 50c. per kilogramme, but that that is not a natural price, and that if Algeria hopes to participate largely in the demand her price must not surpass 8 francs per kilogramme for long-fibre cotton; Lille says that the question is a difficult one to answer, and the price must depend on the supply from America. The diversity of opinion between the Chambers of Commerce of Marseilles and Havre is remarkable.

Colonies.

The New Zealand Exhibition.—A photograph of the building intended for this Exhibition, erected at Dunedin, Otago, from the designs of Wm. Mason, Esq.,

architect, one of the Commissioners, shows that it is a handsome building, with two wings. The central portion is already completed and roofed in. The Exhibition bids fair to be a decided success, for the British and Foreign exhibitors who have already had space allotted to them will cover an area as large as that given to all the British colonies in the Exhibition of 1862, viz., 10,000 net superficial feet—besides between 4,000 and 5,000 feet of wall space. Our manufacturers, although at first a little apathetic, have gradually taken a more earnest interest in the undertaking, and Halifax, Leeds, Bradford, Sheffield, Birmingham, Glasgow, London, and many other of the principal towns will be well represented. Such persons as Messrs. Shand, Mason, and Co.; Messrs. Broadwood and Sons; S. W. Silver and Co., Jennings, and others of London; John Crossley and Sons, and H. C. M'Cree and Co., of Halifax; Spear and Jackson, Robert Sorby and Co., and all the leading firms of Sheffield, besides many other well-known manufacturers of agricultural implements and machinery all over the country are exhibitors, and our manufactures are likely to be creditably represented. The Indian Board send out a very fine collection of raw produce and manufactures of the East; and the Department of Science and Art are also exhibitors. The Commissioners report that they were in the receipt of very encouraging accounts from all parts of New Zealand and Australia. The Commissioners have arranged for the publication of a series of very valuable essays by some of the ablest men in New Zealand, under the editorship of Dr. Hector. The following are the subjects:—I. *History*—1. "On the Native Races," by Dr. Shortland, of Auckland. 2. "On the Province of Auckland (unassigned). 3. "The Provinces bordering on Cook's Straits, Wellington, Nelson, Taranaki, Hawke's Bay, and Marlborough," by F. Dillon Bell, Esq. 4. "On Canterbury," by J. E. Fitzgerald, Esq. 5. Otago and Southland, by W. H. Critten, Esq. II. *Statistics*—1. "Commercial, Pastoral, and Agricultural," by the Chambers of Commerce. 2. "Vital Statistics" (unassigned). 3. "On the Diseases of New Zealand," by Mr. Hocken. 4. "Gold Mining Statistics, and History of the Gold Fields of New Zealand," by Vincent Pyke, Esq. III. "*Meteorology* of New Zealand," by Dr. Knight, Auckland. IV. *Geology*—1. Of the North Island, by the Hon. J. Crawford. 2. Of Nelson and Canterbury, by Dr. Haast. 3. Of Otago, by Dr. Hector. 4. "Mineralogy and Mining of New Zealand," by J. R. Hackett, Esq. V. *Botany* (Geographical and Economic)—1. Of the North Island, by Mr. Colenso. 2. Of the South Island, by Dr. Munroe. VI. *Zoology* of New Zealand and the neighbouring seas, by the Rev. R. Taylor. These essays, from the pens of thoroughly competent men, will bring together a mass of recent authentic information respecting the colony which will be of great value alike in a scientific, commercial, or colonial point of view. The Commissioners are securing the services of a competent engineer from Melbourne to conduct the experiments for testing the strength of materials, which they propose carrying out.

A Nelson paper says, that at last there is a chance of a trade with Melbourne being opened up, a company having been formed at Dunedin to work two steamers between Melbourne and the ports of the Southern Island, calling at Wellington. At present communication with Melbourne is so uncertain that many orders which would be sent there are sent to Sydney instead.

Resources of Otago.—A local journal says that Otago possesses a population of sixty thousand, altogether untaxed except through the customs revenue. This population is not of a pauper class; there are no poor-houses, and a professional beggar is a rarity. It is, in short, a wealthy population. The earnings of all classes of the community are far in excess of those of persons in the same position and with the same capital at home. Here is a population then ready and able to be taxed, if taxation be necessary to meet its engagements. But what need of taxation? It is magnificently endowed with a public estate set apart to meet its liabilities. The unsold lands of each province belong to it, and the assembly has recognized the principle, though it is not yet embodied in statutory form, that the land may be offered as a first security to creditors of the province. According to a return laid on the table of the council last session, the land available for immediate sale was 600,000 acres. There were besides over six millions of acres under pastoral lease, any portion of which could, by proclamation, be withdrawn from occupation and offered for sale. The new land act passed last session is expected to come immediately into force. It proves that the upset or lowest price at which land can be sold is £1 per acre, with an additional payment of 2s. per acre per annum until improvements, to the amount of £2 per acre are effected. With regard to land occupied for pastoral purposes, the occupiers were the pioneers of the country, and the encouragement was naturally given them of short leases at trifling rates. These leases will fall in the course of a few years, and the land will be available for re-letting. It is impossible to conjecture the price it will fetch, but something very high may be counted on. Land not particularly good, or very favourably situated, produces a rent of from 6d. to 8½d. per acre per annum. When the leases fall in, and more favourable terms can be offered to occupiers, the rents will yield to the province a magnificent income. Then there are the gold fields; these have been sufficiently proved to show they cannot be worked out for many years, The rivers indeed will be inexhaustible; every flood brings down fresh deposits. On every ounce produced, 2s. 6d. is paid to the state for export duty. This also is available to the use of the province. Otago has received during the last two years and a half from this source, £182,000.

Border Customs in Australia.—This question is likely to create some correspondence between the three governments interested in the navigation of the Murray. New South Wales favours a protectionist policy, while Victoria raises her customs revenue from a few articles only, that as few restrictions as possible may be placed on the freedom of trade. The whole of the commerce of the Riverina district of New South Wales, large and rapidly growing as it is, has passed of late years into the hands of Melbourne. The approaching completion of the Victoria Railway to the banks of the Murray, and the steps now being taken to facilitate the navigation of the Upper Murray and its tributaries, for which £10,000 has been voted, have awakened the New South Wales government to their interests in the district in question. They propose that Victoria should collect the dues for them that their tariff imposes upon goods entering Riverina by way of Victoria, in addition to those which are collected at Melbourne under the imposts of the government there. This the government declines to do, and the government of South Australia, which for a length of time served the Sydney government in this matter, now refuses to continue to do so unless Victoria collects also. To facilitate the collection of Riverina dues, a border customs' bill has been lately passed by the Sydney government; a custom-house is to be built, and a number of officers will be spread along the north bank of the river. There is no disposition on the part of the people of Riverina to pay double duties, and as the politicians of Sydney are unwilling to adopt the free trade doctrines popular in Victoria, an extensive system of smuggling on the borders seems not improbable.

The Victoria Vintage is expected to be poor; a wet spring, with its accompaniment, the blight, so destroyed the vine blossoms that in some vineyards the berries on the plants could almost be counted at a glance. The cool summer again so retarded the ripening of the fruit, that in some places the vintage is five or six weeks behind time. More recently the heavy rains played serious havoc just as the fruit was ready for gathering. Under these adverse circumstances the vintage promises to be the lightest this colony has had for years

Tobacco at the Cape.—Mr. T. Gurney Hawes, in a letter to the secretary, dated Mossel Bay, Cape of Good Hope, June 16th, 1864, says:—"I notice, in the Society's *Journal* of the 29th April, a paragraph relative to the growth and preparation of our colonial tobacco, in which great credit is awarded to the Eastern Province for its energy and perseverance, as exemplified by the fact of Mr. Rautenbach having obtained the prize for that article at the agricultural show at Humansdorp. I would wish, however, due justice to be done to our Western Province, which although, as truly stated, composed chiefly of Dutch inhabitants, who are very loth to depart from the customs of their ancestors, has shown far more energy and determination to succeed in the manufacture of tobacco than our eastern friends. To Mr. Powrie, of this village, was awarded the first prize for Cavendish and leaf tobbacco, cigars and snuff, at the agricultural show held at Swellendam this year, and he also obtained similar reward for his Cavendish and "golden leaf" exhibited at the show held at Uitenhage, in the Eastern Province. Since then a very spirited and well-directed effort has been made by two gentlemen, also residents here; they intend not to prepare the tobacco as at present produced by the farmers, who know nothing of the proper method of treating the leaf after it has been gathered, but, commencing at the first step, have laid under cultivation a large tract of moist fertile soil near George Town, the whole being under the charge of an American gentleman, well acquainted with all the details of its growth and preparation. The seed is already in the ground, and we confidently look forward to the time when not only will it be unnecessary to import tobacco from America, but when Mossel Bay will become the seat of a large export trade."

Obituary.

Rodolphe Wagner.—The University of Gottingen has lost one of its most distinguished professors by the death of Rodolphe Wagner, after a long and painful illness. M. Wagner was born in 1805, his father having been rector of the Protestant Gymnase of Augsbourg, where the son received his early education. Louis Napoleon was afterwards at the same school, under the tutorship of the elder Wagner. Rodolphe Wagner studied medicine at Erlangen and Wurtzbourg, and became doctor at the age of twenty-one. In 1827 he was in Paris studying under Cuvier, and he afterwards devoted himself to comparative anatomy. After leaving Paris he explored the coasts of Normandy, of the south of France, and of the Island of Sardinia, where he discovered an important deposit of fossil bones. Returning to Germany he established himself at Augsbourg. In 1829 he was attached to the University of Erlangen as anatomical preparator, and in 1832 he became professor of zoology in the same establishment. From 1832 to 1840 he published several works, which attracted the attention of the scientific world; amongst these were:—"Study of the Blood," "A Treatise on Comparative Anatomy," and another on "Comparative Physiology." On the death of the celebrated physiologist, Blumenbach, Wagner was elected to the professorship thus rendered vacant in the University of Gottingen, where he remained till his death. In 1845 and 1846 he went to Italy for his health, which had long been failing, and it was there that he conducted a series of valuable experiments on the electric organs of a fish belonging to the skate tribe. He was the author also of many other publications on pure and comparative anatomy, zoology, and anthropology; amongst others a "Dictionary of Physiology," "A Memoir on the Structure and Termination of the Nerves" (1818), and "Researches in Neurology" (1864). M. Wagner was one of the most eminent representatives of the scientific spiritualists of Germany. His studies on the brain, as the organ of intelligence, tend to throw a doubt over the supposed connection between the amount of intelligence and the volume of that organ. At the thirty-first congress of naturalists, in 1854, a very lively dispute arose on that and cognate questions between Wagner and Fichte, on the one part, and Vogt and Moleschott, on the other; the discussion was maintained with great ardour, and created an immense sensation, which lasted for years, and gave rise to an immense mass of publications *pro* and *con*. A work entitled "Zum Streit über Leib und Seele," which appeared at Hamburg in 1856, consists principally in a resumé of this famous discussion. In 1862 Wagner published two important memoirs on anthropology, in which the relation of the brain to the mind is treated at great length; this gave rise to a long and brilliant series of discussions in the Anthropological Society, in which M. Gratiolet and M. Broca bore prominent parts.

Notes.

Universal Agricultural Exhibition in Algeria.—This exhibition, which is held alternately in the three provinces of Algeria, opens at Oran on the 24th of September, and will close on the 2nd of October. A sum of 30,000 francs is voted for the prizes to be awarded. All exhibitors not of the colony will have to transport their produce or implements to the port of Mers-el-Kébir, at their own cost, but the railway and steam navigation companies have fixed a low tariff of charges for the special case; the Algerian Government will convey everything admitted for exhibition from the above-named port to Oran at its own charge. Exhibitors will be conveyed from the French or other coasts to Mers-el-Kébir free of charge. Algeria has become a regular place of resort for valetudinarians, and there such exhibitions as these, and the increasing cultivation of cotton, will probably draw other classes towards that curious country.

The Effect of Liquid in Producing Fatness.—Much has been said of late concerning the effect of various kinds of diet on the condition of the body, and especially upon the production of fat; and M. Darcel, of Paris, has just added a valuable chapter on the subject. He says that, during a long course of experiments and observations relative to the reduction of obesity in man, he has remarked that those who have carefully abstained from the use of fatty and fat-producing articles of diet have not diminished in weight while they continued to drink large quantities of liquid. Hence he was led to the belief that water and aqueous substances favoured fatness. Water, he believes, plays a great part, and he expresses his surprise that, in the numerous experiments made on animals, this element has been almost entirely disregarded. In the Garde de Paris there was a horse remarkable for its leanness, and, at the instance of M. Darcel, M. Decroix, the veterinary-surgeon of the regiment, made the following experiment:—He reduced the animal's ration of oats, without diminishing the regular quantity of straw and hay, and gave him as much water as he would like to drink with a little bran in it, amounting to about a pound of the latter per diem. At the end of May last, the horse weighed 512 kilogrammes; on the 17th June, 530 kilogrammes; an increase of 18 kilogrammes (nearly 40 lbs. English) in 17 days, for which the pound of bran, substituted for three pounds of oats, could not alone account. In the same regiment was another horse which was so fat that it suffered severely under its work. This horse consumed 60 litres of water a day; this was at once diminished to one-fourth; the horse soon began to lose its fatness, acquired activity, and performed its work without any of the symptoms of distress which it had formerly exhibited.

An Old Water-wheel.—A wheel, composed entirely of wood, down to the very treenails, as a sailor might say, was found some time since in the mines of Saint Columbo, in Portugal. This wheel was employed to pump the water out of the mine, and is believed to have

been constructed by the Romans during their occupation of Portugal, that is to say, about the year 412 of our era, or upwards of 1,400 years ago. The wheel is still in fair condition, and it is said that it will probably be placed in the Conservatoire des Arts-et-Métiers, in Paris.

Proposed Bridge over the Straits of Messina.—The Italian engineers have announced a project of bridging over the straits that divide the island of Sicily from the main land. The plan proposed is a new form of suspension, the chains to be of cast steel, and the structure of sufficient strength to bear the strain of many railway trains at a time.

Fish Preserves in France.—There is a small fishing town on the coast of Brittany called Concarneau, in a secluded bay surrounded by hills, well wooded to the water's edge. Fish preserves have here been blasted out of the solid granite rock, leaving strong walls of granite to resist the action of the waves. The superficial area thus enclosed is 1,000 square metres, and is divided into six basins, which the water enters at high tide twice a day, passing out at low-water through openings with gratings, or not, as may be thought desirable. All kinds of fish which are caught on the coast of Brittany are received into these basins, where they live as they would in the sea. There the turbot may be seen, with his mouth opening like that of a snake to take his prey, enjoying himself by the side of the sole and the plaice, which lie immoveable, in colour like the bottom on which they rest. There also may be seen shoals of mullet feeding on the seaweed, the red mullet seizing, with his two feelers like delicate fingers, the food he devours; the skate threading his way through the water, using his fins as a bird does its wings, the gurnet stretching in the sun his brilliant pectoral fins, glistening with colours as rich as those of the butterfly; the John Dory moving with solemn pace, using his dorsal fin like a screw propeller; the conger hiding himself behind the rock, watching for his prey; the sardine darting in every direction, his presence manifested by the blue tints of his back, and only escaping his numerous enemies by the rapidity of his movements, calling to mind the peculiar flight of the swallow. In a very few days the fish become domesticated and sufficiently tame to eat out of the hand. Guillou, an old pilot, who has the care of the preserves, has taught two congers to pass through his hands when he calls them. In these basins the fish grow rapidly; turbots especially. The basins for the crustaceans are divided into three compartments, in two of which are from 1,000 to 1,500 crawfish* (*langouste*) and obsters, living in captivity with no serious amount of mortality, fed upon fish of no value, or the heads of the sardines, which are thrown aside when preserving this fish in oil. They may be seen flying from the light and hiding themselves under the shelter prepared for them. The lobsters move but little, and lie hid under stones or in hollows of the rocks. The crawfish, on the contrary, are more active, and are always climbing about, snapping up a sardine in a moment. These crustaceans too, are very fond of the star-fish. Star-fish as large as 20 centimetres in diameter, when thrown in are seized at once, five or six of the craw-fish fastening on each finger, breaking off a piece, and rushing away with it to eat at their leisure. They are also very fond of mollusks. The jaws of the craw-fish are so formed as to be able to penetrate the shell of the oyster, and get at the animal himself, which is a very favourite food. These breeding basins become actual nurseries for re-stocking the sea with fish. They have succeeded in bringing up young lobsters, even to the twentieth casting of the shell, that is, for four years. It is only about the fifth year that the lobster acquires his legal size of 20 centimetres in length. The system is being extended, and preserves of this kind for fish crustaceans and mollusks are being established on various parts of the shores of France. The most remarkable of them is that of Cresoles, on the Ile de Tudy. It covers 70 hectares, and at this time contains 75,000 crawfish. Thus the original establishment, by Pilot Guillou, of this fish preserve (a sort of aquatic farm-yard) has become the signal for the creation of new industries, which provide not only in themselves an increase in production of food, but aid materially in turning the sea to account and increasing its productiveness.

* Not the small common crawfish (*écrevisse*) which lives in the fresh waters, but a large lobster-like animal, often 18 inches long, and weighing as much as twelve or fourteen pounds. It is esteemed a great delicacy, and a delicious soup is made from it at Marseilles and all along the Provence coast, very much richer than the well-known *potage d'écrevisse*.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 18th and 20th June, 1864.*

154. ,, Cranbourne Street.
156. ,, Countess of Elgin and Kincardine's Annuity.
160. ,, Judgments, &c., Law Amendment (amended).
162. ,, Divorce and Matrimonial Causes (Amendment).
159. ,, Inland Revenue (Stamp Duties).
Statistical Abstract for the United Kingdom (1849 to 1863).
Anderson, The Rev. F.—Papers relative to the Arrest of.
Prussia—Convention for the Mutual Surrender of Criminals.
Russia Company—Correspondence.

Delivered on June 21st, 1864.

331. Tasmania (Van Diemen's Land)—Report of Mr. Gould.
378. Metropolitan Subways Bill—Report.
398. Army Clothing Factories (Woolwich and Pimlico)—Return.
161. Bills—Scottish Episcopal Clergy Disabilities Removal.
150. ,, New Zealand (Guarantee of Loan).

Delivered on 22nd June, 1864.

274. West India Mails—Extracts of Correspondence.
408. Navy ("Ship Research")—Additional Official Correspondence
Education—Minute of 11th June, 1864.

Delivered on 23rd June, 1864.

389. Lunacy—Eighteenth Report of Commissioners.
391. National Education (Ireland)—Circular of Instructions.
395. Case of Mr. Bewicke—Report, Evidence, &c.
155. Bills—Local Government Act (1858) Amendment.
163. ,, Contagious Diseases.

Delivered on 24th June, 1864.

411. Army (Small Arms)—Return.
164. Bills - Sheriffs Substitute (Scotland).
165. ,, Weights and Measures (Metric System) (amended).
166. ,, Indian Office.

Delivered on 25th and 27th June, 1864.

373. Thames Conservancy Bill—Report, Evidence, &c.
403. West Riding of York Assizes—Order in Council.
62 (vi.) Committee of Selection—Seventh Report.
396. Judgments, &c. Law Amendment Bill—Report, Evidence, &c.
419. Vessels and Tonnage, &c.—Return.
425. Metropolitan Railways—Return.
167. Bills—Penal Servitude Acts Amendment (Lords Amendments).
168. ,, Public Schools.
170. ,, Inclosure (No. 2).
169. ,, Mortgage Debenture.
172. ,, Weighing of Grain (Port of London) (amended).

Delivered on 28th June, 1864.

376. Royal Mail Steamer "Africa"—Evidence.
394. Prison Ministers' Act (Middlesex)—Correspondence.
407. School of Naval Architecture—Correspondence.
412. Army (Manufacturing Departments, Woolwich and Enfield)—Comparative Prices.
421. Removal of Paupers—Return.
173. Bills—Railways (Ireland) Acts Amendment (amended).
174. ,, Ecclesiastical Courts and Registries (Ireland).
Denmark—Protocols of Conference held in London.
North America (No. 15)—Papers respecting the Arrest and Imprisonment of Mr. J. McHugh.

Delivered on 29th June, 1864.

413. Captain Wolfe de Carvel—Correspondence.
420. Exports and Imports—Return.
432. Malta New Dock—Letter, &c.
176. Bill—Registration of Deeds (Ireland).

Delivered on 30th June, 1864.

66 (v). Trade and Navigation Accounts.
348. Belfast Improvement (No. 2) Bill—Minute of Evidence.
414. Dublin Corporation (Bills in Parliament)—Return.
426. Portpatric Harbour—Return.
427. East India (Officers)—Despatch.
433. Joint Stock Companies—Return.
434. Medical Degrees—Return.
440. Thames Embankment—Letter.

171. Bills—Harwich Harbour Act Amendment.
177. ,, Highways Act Amendment (amended).
179. ,, Administration of Trusts (Scotland) (amended).

Delivered on 1st July, 1864.

401. Sioux Indians—Extracts of Correspondence.
402. Canada and Pacific Telegraph—Extracts of Correspondence.
417. Carlisle Cathedral—Return.
418. East India (Lieut. Bartholomew)—Correspondence.
429. East India (Civil Appointments)—Return.
447. George O'Malley Irwin—Letter.
448. Law Courts Concentration—Treasury Minute.
175. Bills—Cattle Diseases Prevention (amended by the Select Committee).
181. ,, Bleaching and Dyeing Works Acts Extension.
182. ,, Election Petitions Act (1848) Amendment.

Delivered on 2nd and 4th July, 1864.

383. Turnpike Trusts—Report, Evidence, &c.
420. Exports and Imports—Return (corrected copy).
432. (I). Malta Dock—Letter.
435. Epping Forest—Letter.
404. Whitwick Reformatory—Report.
422. Clonmel (Ireland) Lunatic Asylum—Correspondence.
423. Standing Orders (Parliamentary Deposits)—Report, Evidence, &c.
442. Royal Naval Reserve—Return.
450. Saltpetre, &c.—Account.
138. Bills—Justices of the Peace Procedure.
183. ,, India Stocks Transfer Act Amendment.
185. ,, Isle of Man Harbours Act Amendment.
188. ,, Courts of Justice Money.
189. ,, Courts of Justice Site.
Chincha Islands—Papers relating to seizure by a Spanish squadron.
Denmark and Germany (No. 6) 1864—Correspondence.

Delivered on 5th July, 1864.

415. Isle of Man—Returns.
428. Isle of Man Lunatic Asylum—Correspondence.
428 (I). Isle of Man Lunatic Asylum—Letter.
437. Constabulary (Ireland)—Statement.
445. Registration of Deeds (Ireland)—Account.
178. Bills—Naval and Victualling Stores (amended).
180. ,, Gaols (amended).
184. ,, Pilotage Order Confirmation (No. 2).
186. ,, Street Music (Metropolis) (amended).
187. ,, Improvement of Land Act (1864).
130. ,, Criminal Justice Act (1855) Extension.
Denmark and Germany—Letters respecting the Summary of the proceedings of the Conferences on Danish Affairs, annexed to 22th Protocol.

Delivered on 6th July, 1864.

997. Arms, &c.—Returns.
400. Custom Duties (Canada)—Correspondence.
438. Roehampton Gate (Richmond Park)—Correspondence.
451. Bankruptcy—Return.
454. Dockyards and Steam Factories—Return.
Ionian Islands—Correspondence respecting the Cessation of the British Protectorate over those Islands.

Delivered on 7th July, 1864.

379. Metropolis Local Management Act—Return.
387. Grain and Corn—Returns.
439. Navy (Masters, &c.), Navy (Officers)—Returns.
453. Postage (Australia)—Correspondence).
456. Banda and Kirwee Booty—Terms of Reference.
191. Bills—Thames Embankment and Metropolis Improvement (Loans).
192. ,, Poisoned Flesh Prohibition, &c.
194. ,, Turnpike Acts Continuance, &c.
Science and Art Department—Eleventh Report of the Committee of Council on Education.

Delivered on 8th July, 1864.

367. Transatlantic Steamers—Return.
441. Copyright (No. 2) Bill—Report, Evidence, &c.
125. Bill—Trespass (Ireland) (amended).

Delivered on 9th and 11th of July, 1864.

55. (viii). Railway and Canal Bills—Ninth Report.
424. River Niger—Correspondence.
459. Expiring Laws—Report.
460. Brandy—Returns.
464. Exchequer Bonds—Account.
465. Army (Officers and Men Drowned)—Return.
370. Finance Accounts (I to VII).
461. Education (Ireland)—Annual Report.
462. Unclaimed Wreck—Returns.
196. Bills—Turnpike Trusts Arrangements.
198. ,, Joint Stock Companies (Voting Papers) (amended).
193. ,, Expiring Laws Continuance.
197. ,, Ionian States Acts of Parliament Repeal.
Russia Company—Furthes Correspondence.
Gold Coast—Further Papers relating to the Military Operations.
Circassian Tribes (Settlement of Emigrants)—Map.

Delivered on 12th July, 1864

371. Steam Vessels—Return.
444. Murder—Abstract of Return.
Public General Acts—Cap. 21 to 38 (both inclusive).

Delivered on 13th July, 1864.

280. Industrial and Provident Societies—Returns.
430. National Education (Ireland)—Return.
436. East India (Navy)—Return.
470. Cambrics, &c.—Return.
471. Cotton Manufacturing Districts—Report.
199. Bill—Poisoned Grain Prohibition, &c. (amended).
Vaccination of Sheep—Report.

Patents.

From Commissioners of Patents Journal, July 22nd.

Grants of Provisional Protection.

Aeriform fluids, obtaining power from—1636—M. P. W. Boulton.
Bottle-corking apparatus—1430—M. Smith and J. Smith.
Bottles, soda-water, &c., securing corks in—1650—E. Templemore.
Centrifugal machines—1631—J. Corby.
Cooking-stoves—1660—A. S. Tomkins.
Eggs, apparatus for sorting—1633—H. Field.
Endless band brush—1661—J. Taylor.
Felting machines—1612—W. Clark.
Gas, apparatus for carburetting—1229—L. Bricout.
Heating and evaporating liquids and fluids—1663—G. H. Palmer.
High-pressure cocks—1651—G. F. Graham and W. Payne.
Hooks for marine and other purposes—1630 R. Balans.
Hydrocarbon gas, manufacture of—1668—W. Lloyd.
Leather, pressed—1680—F. J. Bugg.
Locomotive engines—1672—J. E. Wilson.
Looms—1680—E. Ratcliffe and C. Ainsworth.
Organs, harmoniums, &c.—1477—W. Dawes.
Potato-planting implement—1682—J. Spencer.
Pumps—1658—W. Jackson, T. Glaholm, and S. S. Robson.
Railway carriages, self-adjusting couplings for—1646—A. V. Newton.
Railway carriage brakes—1573—W. Clark.
Railways, rails for permanent way of—1491—S. Truss.
Rope-making machinery—1361—S. Scrine.
Sewing machines—1632—A. Kimball.
Ships, means of bathing in 1579—J. Bailly.
Ships, composition for preventing fouling of—1652—W. B. Davis.
Slags, treating for production of cast steel—1656—S. Fox.
Steam-boilers feed apparatus for—1654—W. G. Craig.
Steam fire-engines—1666—D. Blake.
Tubes, &c., removal of air, gas, &c., from—1638—F. L. H. Danchell.
Wine, &c., apparatus for decanting—1648—J. Ellis and J. Adams.
Yeast and starch manufacture—1624—C. Frielinghaus.

Invention with Complete Specification Filed.

Sewing and stitching machine—1788—T. F. Hodge.

Patents Sealed.

203. W. Ibotson.
212. S. Vaile.
220. R. A. Brooman.
222. W. Norton.
223. H. C. Huskinson.
228. W. E. Gedge.
236. E. W. James.
237. J. Rodgers.
241. N. J. Holmes.
245. S. Dixon & J. Calvert, jun.
247. W. E. Maude.
252. P. A. le C. de Fontaine-Moreau.
278. P. W. Gengembre.
279. S. Ferguson, jun.
343. F. W. Webb.
832. C. D. Tisdale.

From Commissioners of Patents Journal, July 26th.

Patents Sealed.

244. G. Canouil.
249. B. l'A. Bromwich.
250. T. M. Heathorn.
257. J. C. Haddan.
258. J. Phillips.
260. E. T. Hughes.
274. D. Anderson.
281. G. Hammond and J. W. Kemp.
287. F. W. Webb.
298. G. Davies.
301. E. Lucius.
305. J. Lee and J. Thomson.
312. M. Runkel.
321. H. A. Fletcher.
345. J. H. Johnson.
360. J. H. Johnson.
386. A. Steinmetz.
429. E. J. Leonard.
475. W. E. Newton.
510. J. Robinson.
674. R. A. Brooman.
722. G. T. Bousfield.
738. W. Leuty.
988. J. H. Johnson.
1081. R. A. Brooman.
1258. J. Webster.
1324. F. W. Brocksieper.

Patents on which the Stamp Duty of £50 has been Paid.

1758. J. Adams.
1824. R. A. Brooman.
1825. J. H. Johnson.
1876. E. Sang.
1822. W. H. Harfield.
1907. J. Rylands, J. G. Rylands, and P. Rylands.
1821. W. Savory & P. H. Savory.
1830. R. Thatcher.
1840. W. E. Newton.
1941. E. D. Johnson.
1829. W. Price.
1841. J. Beattie.
1843. G. F. Griffin.
1846. R. Thompson.
1869. E. Haeffely.
1871. C. Robertson.

Patents on which the Stamp Duty of £100 has been Paid.

F. H. Holmes.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, AUGUST 5, 1864. [No. 611. Vol. XII.

Proceedings of the Society.

CANTOR LECTURES.

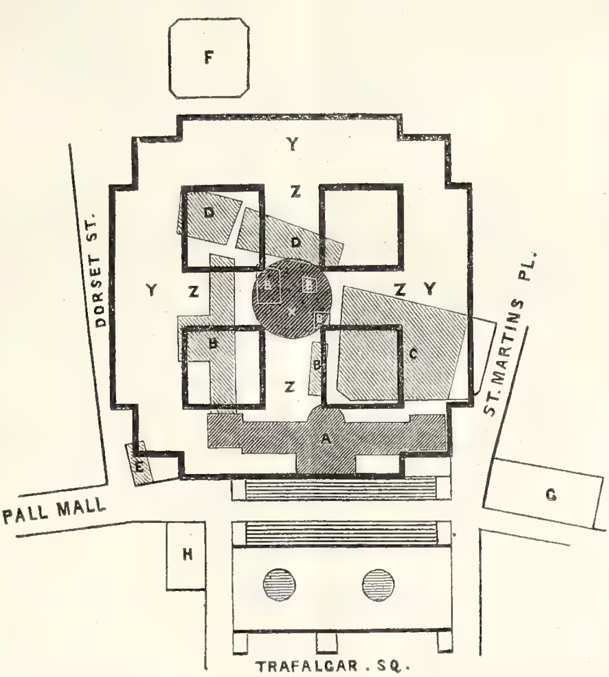
The publication of Dr. Crace Calvert's course will be resumed in an early number.

NATIONAL GALLERY AND ROYAL ACADEMY.

The following plan for combining the National Gallery and Royal Academy on the site of the present National Gallery, has been suggested by Mr. C. Bruce Allen, architect:—

Unity of purpose and definiteness of aim constitute strength, and the reverse weakness and impossibility of action, say the masters of military art, and events perpetually prove the truth of it, if not in warfare at least in fine-art matters and movements, for at no time in Art history have there been such efforts made and so much thought given to Art and its progress as now, but unhappily, from want of accord and aim, without practical result. It is for the purpose of helping, as far as may be, this desired end—a definite purpose—that this suggested plan of combining the two great central art establishments of England is suggested; the one the national collection of pictures, and the other the guiding schools and modern effects of the study of them.

In spite of all that has been said of it, there certainly does not exist in London, with the exception of Primrose-hill, so fine a site for a good building as that now occupied by the present National Gallery; and most certainly there is not in Europe a worse building, or one more unworthy of its purposes and the country. The annexed plan, it is hoped, will at least be found to indicate something better:—



REFERENCES TO THE BLOCK PLAN.

A. Present National Gallery and Royal Academy, one-half being occupied by the National Gallery and Pictures, and the other half by the Royal Academy and its Schools and Library.

B. St. George's Barracks—the upper story proposed to be devoted to the purposes of the Royal Academy, as a temporary accommodation for its annual Exhibition, and the lower story for its Schools, Library, Casts, and Offices.

C. St. Martin's Workhouse and Archbishop Tennison's School, proposed to be used temporarily for the National Collection of Water Colours and Engravings.

D. Chapel and Baths and Wash-houses.

E. Military Store.

F. Leicester-square. North Front of New National Gallery.

G. St. Martin's Church.

H. Royal College of Physicians.

X. Circular Domed Central Hall, proposed to be built first for the purposes of the Royal Academy Exhibition, on the site of the present Barrack-yard, unoccupied except by small buildings, B B B, and at the expense of the Royal Academy.

Z Z Z Z. Buildings forming a cross from the Central Hall, to be built by and for the purposes of the Royal Academy.

Y Y Y. Future National Gallery, forming a square, size of the Great Court of the Louvre.

It is suggested that, in the first place, the whole of the present National Gallery, now partly occupied by the Royal Academy, should be used, without any alteration or expense whatever, for the purposes of the national collection of pictures, and that the Royal Academy should then occupy (as soon as barrack accommodation can be provided elsewhere) the whole of the plot of buildings marked B on the plan. No expense beyond the mere fitting the rooms to their temporary purpose is contemplated, as the upper rooms of the barrack buildings would form long corridors, lighted from the roof, suitable for the exhibition of pictures and sculpture, the public entrance being through the National Gallery itself, thus giving the public, as suggested by Lord Palmerston, an opportunity of comparing the doings and efforts of the past with the present. As the needs of the Academy increased, it is suggested that the chapel and baths and wash-houses, marked D D on the plan, should be occupied by it for its schools and library, and collection of architectural and other casts, so as to leave further space for its annual exhibition; the different buildings being, of course, temporarily connected together. It is thought

that by this plan so large a space would be available that all objections to a more liberal action on the part of the Academy would cease, and that reform would become a reality, so that the more humble and less known artists would have opportunities of exhibiting their works, now impossible from the simple want of space to put them in. It is obvious, too, that the schools of the Academy, on which nearly its whole power over Art in the future surely rests, might be increased to almost any extent, and that its generous plan for giving free instruction and help where it is most of all needed, might be made almost infinitely more effective than it is, in the presence, too, of a fine collection of antique art.

But the point in the plan to which attention is more especially desired is that of the possibility, on the part of the Academy, of erecting for itself a building or buildings on a scale of magnificence worthy of it and of its reputation in art. It will be observed that the circular room, marked X on the plan, stands in the present barrack-yard, occupying only the space of two or three small buildings, now used, it is believed, as guard-houses, and might be commenced by the Academy without even for years disturbing any of the existing or temporary arrangements. In the plan the buildings D D are shown rather too near the circular building, as there is a clear space of the narrow street (Orange-street) between the two buildings X and D.* So that this first building by the Royal Academy itself, and out of its own funds, would be commenced without creating even temporary inconvenience, either to itself or to any arrangements the National Gallery might require. A temporary communication would, of course, be needed between it and the building B. Nothing need here be said as to the height or scale of cost and architectural skill of such a structure, as that must of course depend on the feelings of the inner Council of the Royal Academy, as to its own dignity and position in art, of which this central building might be supposed to be representative and emblematical.

The whole of the present National Gallery, being, as already suggested, devoted to the purposes of the national collection of pictures by the removal of the Royal Academy to the barrack buildings, would doubtless for a time answer all the purposes of housing all its present collection of pictures, at least, both ancient and modern; but it is suggested that if prints, photographs, and drawings should ever be contemplated as a necesary part of a future national display of art, the building marked C on the plan, *i.e.*, the workhouse buildings and the schools of Archbishop Tennison, should be next acquired and temporarily used for their exhibition, but without any further expense than will make them available for such a purpose, and with temporary communications between them and the present gallery. This plan might for many years answer all requirements, and would have the very important advantage of affording time for the thoughtful development of a structure in the future, worthy in design, style, and workmanship of its purpose and its place.

The whole of the future National Gallery of the Fine Arts is represented on the plan by the firm outline and the letters Y Y Y and A, now occupied by the present structure, and forms a square between Trafalgar-square and Leicester-square, now altogether occupied by very inferior houses and property. It fills exactly the space occupied in Paris by the grand court of the Louvre, and would, for the purposes of art, form the most magnificent square in Europe if at all worthily handled. It is here, too, that this plan would seem to offer some advantages to others that have been at sundry times proposed, for, as will be seen, the angle at E, now occupied by a military-store establishment, might be the point of commencement of the future Gallery on a great scale, and the whole of the west-side portion, Dorset street, erected in portions, and from time to time, as need and funds required and allowed; communication being made between the present building and the newly-built portions. Thus it will be seen that the present National Gallery would not for very many years need to be touched, and would answer all useful purposes, while the nation and the House of Commons would have the satisfaction—no slight one—of feeling that something was at last being done to remedy existing defects and make up for so much and such long delay; the House of Commons having justly determined to keep the national pictures where they are. Not to lengthen at present this short sketch, it may be mentioned that the site of Trafalgar-square is so good from the simple fact of the ground rising from Charing-cross to the Gallery building, thus placing the building at the greatest possible advantage, inasmuch as the spectator looks up at it and approaches up to it; indeed, as the Parthenon at Athens was approached. This affords opportunity for flights of steps, as shown on the plan, being constructed on a scale worthy of the building and the site, and would certainly add not a little to its value as an art work.

As it is the fashion now-a-days to suggest several ways of doing a thing for which in reality there is but one right way, it may be added that the length A would be a complete building, and A Z another, and A Z Z another, and so on. And, should the ingenious reader think proper to try it, he will find that no less than nineteen ways of forming—according to modern notions of completeness—perfect buildings may be made out.

The future additions by the Royal Academy would be by means of the arms of the cross, Z Z Z Z, so as to communicate with the domed hall and the corridors of the gallery; the cost to the Academy and the Government being regulated strictly by future requirements and means and public demands.

In submitting this rough and very hasty sketch to the consideration of those who may feel interested in it, both in the Society of Arts and out of it, the author of it would express his own opinion in favour of a concentration of all original art objects, both pictures and the results of the labours of the art-workman, that is, of all that is left to us of the past, in one building, or in buildings communicating with each other. He would, therefore, in this plan, suggest to the members of the Society of Arts whether it would not be worthy of an effort to try and secure for it, as an institution taking cognizance of the artist workman, a portion of any such future structure; for should the Society take up in earnest, and as a part of its art action, the cause of the artist workman, very greatly additional space to what it now has would be needed. The importance of this action cannot be overstated.

* A reference to the large scale Ordnance Map will show this.

MEMORIAL TABLETS ON LONDON HOUSES.

The *Builder* makes the following suggestions on this subject:—

The Church of St. Mary Overy, or St. Saviour's Southwark, might carry, at little cost, words to this effect:—

" In this Church,
and
Beneath nameless stones,
lie the Remains
of
John Fletcher,
Poet,
(Beaumont's associate);
and of
Philip Massinger,
Poet,
Author of 'A New Way to Pay Old Debts.'
Fletcher died in 1625, of the Plague,
and
Massinger in 1638-9."

On an outer wall of the same church we should like to read:—

"In this Church of
St. Saviour, Southwark,
was buried,
31st Dec., 1607,
'With an afternoon's knell of the great bell,'
EDMUND SHAKSPEARE,
Player,
Younger brother of
William Shakspeare.
(England's myriad-minded Poet
was then a shareholder and actor
in
The Globe Theatre,
in this parish)."

This, on the little Church of St. Peter, in the Tower, would serve a good purpose:—

"SIR JOHN ELIOT,
of
Cornwall,
the fellow-labourer with
John Hampden and John Pym
in defence of
Liberty,
Died a Prisoner in this Garrison,
in 1632, aged 42,
and
was buried, by command of
King Charles I.,
in this Chapel of
St. Peter ad Vincula.
The stone which covers his body is
uninscribed."

Shaftesbury House, in Aldersgate, should be made t carry:—

"In this House
(Inigo Jones, architect)
Lived and Caballed
ANTHONY ASHLEY COOPER,
Earl of Shaftesbury
and
Lord High Chancellor of England,
In the reign of
King Charles the Second."

A church near to the Guildhall would "stay" many a "passenger" to read words "akin to these":—

"In this Church of
St. Lawrence Jewry
(Sir Christopher Wren, architect),
GILBERT BURNET, Bishop of Salisbury,
Preached in 1694
The Funeral Sermon of
John Tillotson,
Archbishop of Canterbury.

In early life the great Tillotson
Was Tuesday Evening Lecturer in this Church."

This would arrest and deserve the attention of all who are wending "Eastward ho!" or "Westward ho!"—

"In the Font of this Church
of
St. Michael's, Cornhill,
THOMAS GRAY,
Author of
'An Elegy written in a Country Churchyard,'
Was Baptized in
The Year 1716."

This, on No. 17, Gough-square, Fleet-street, would bring a debt of national gratitude to complete remembrance:—

"In a Garret
In this Square
SAMUEL JOHNSON
Compiled
His famous Dictionary
of
The English Language."

This, in Silver-street, Golden-square, would please more artists than Mr. Clarkson Stanfield or Mr. David Roberts:—

"At Mr. Viggans' in this street,
Lived,
In the year 1752,
ANTONIO CANALETTI
The well-known Painter of "Views of Venice."

The Poet Laureate, we are sure, would not be displeased at seeing a stone to this purport in Piccadilly:—

"In this Church of
St. James's, Westminster,
Lies buried,
MARK AKENSIDE,
Author of the 'Pleasures of Imagination.'
Born 1721. Died 1770."

Mr. Macready, when in London, and in Great Marlborough-street, would bow with reverence to the house connected with the name of Mrs. Siddons:—

"SARAH SIDDONS,
In the height of her Fame
as
England's greatest Actress,
Lived in this House."

Baron Marochetti, again, would be pleased to be reminded of a great sculptor:—

"In this House,
No. 30, Lower Belgrave-place,
SIR FRANCIS CHANTREY,
Sculptor,
Died,
In the year 1841.
All his finest works
Were executed
Here."

Even an ancient Royal Academician would not grumble at seeing, on No. 30, Allsop-terrace, New-road, an inscription to John Martin:—

"In this House,
JOHN MARTIN,
The painter and engraver of 'Belshazzar's Feast,'
And other noble works,
Lived for five-and-twenty years.
The gallery in which he worked
(At the rear of the house)
Is still to be seen.
He died in 1854,
In the Isle of Man."

The late Right Hon. John Wilson Croker, were he alive, and in Savile-row, would have given a nod of approbation at reading,—

"In this room
(Of set No. 1 E in the Albany)
THOMAS BABINGTON MACAULAY
Baron Macaulay,
Wrote the earlier half
of his
'History of England;'
And in
Set No. 2 A,
LORD BYRON
Wrote his poem of 'Lara.'"

We cannot conclude without renewing a hope and repeating a belief that something will be done—and soon

too—in a matter that will be honourable to those who erect, and pleasant and suggestive to those who read.

We have pleasure in drawing attention to the following letter:—

"Sir,—The admirable suggestion contained in your paper, of marking, in a permanent manner, the residences of great men (why not of women, too?) in London, cannot, I think, fail of being responded to.

"In order to carry this suggestion into a practical use, it is evident that money must be forthcoming; and, as a beginning, I am authorised by a kind and liberal friend to inform you that he is ready to subscribe twenty pounds towards this good work; and, should it be responded to, as I can have no doubt but that it will be, the money will be paid on an application from yourself made to,—Yours, &c. Edward Jesse."

EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 604.)

PRACTICAL MECHANICS.

THREE HOURS ALLOWED.

1. Distinguish between "spur" and "bevil" wheels; what is the pitch circle of a toothed wheel? How could you conveniently connect two axes by a train of wheels when you wished one axis to revolve 720 times as fast as the other?

2. Define a "screw surface" and the "pitch" of a screw. Describe the screw-cutting lathe, and explain the method of using a set of change-wheels.

3. When a beam is moved lengthways upon rollers, why is the travel of the beam twice as great as that of the rollers?

4. Explain the arrangement of three pulleys and three bevil wheels for producing a reversing motion in a planing machine: describe also some contrivance for obtaining a reversing motion with a quick return.

5. When two unequal cranks, moveable upon centres, are connected by a link, compare their angular velocities in any given position: what are the conditions under which a continuous motion of one crank would impart a reciprocating motion to the other

6. Select and explain some examples which illustrate the use of cams in machinery.

7. Enumerate the principal parts of a double-acting condensing steam-engine, and point out very briefly the uses which they severally fulfil.

8. Analyse the arrangement and method of construction of marine engines of the following classes:—(1) oscillating engines, (2) horizontal trunk engines.

9. Explain the eccentric for working the slide-valve of a steam-engine: draw the locomotive D slide-valve, and the ports for the passage of the steam, giving at the same time a description of your drawing.

10. What is the construction of the indicator? How may it be used for the purpose of ascertaining the actual working power of a steam-engine. Draw an indicator diagram of the character which you would expect to take from a condensing steam-engine.

MAGNETISM, ELECTRICITY, AND HEAT.

THREE HOURS ALLOWED.

1. Explain what you consider the best construction of a mariner's compass? By what arrangement of the needles may some errors of deviation be obviated?

2. Explain the influence of some periodic natural phenomena on the earth's magnetism?

3. Define the relations of magnetic and diamagnetic force.

4. State the two theories of electricity, and give any reasons you may have for preferring either.

5. State the difference between an electrometer and an electroscope, and explain the construction of the condensing electroscope.

6. What are the conditions of efficiency in a lightning-conductor?

7. Give some experimental proof of the identity of the electricities of the machine and the battery.

8. What is an astatic needle? How is it employed in a galvanometer, and what position ought it to assume?

9. State the phenomena of electro-magnetic rotation, and explain them by the action of some well-known apparatus.

10. Explain the construction of Wheatstone's magneto-electric telegraph.

11. Give the construction of an induction coil machine, and state the means of intensifying its action.

12. Can electricity be advantageously employed as a motive power? State the reasons for your answer.

13. Explain the ordinary electrical state of living nerve and muscle.

14. Explain and illustrate the transmission of heat by conduction and by convection.

15. Describe the best means of observing very low, medium, and very high temperatures.

16. Define specific and latent heat, and state their numerical amounts, respectively, in some well-known bodies.

17. State some points of analogy between radiant heat and light, and the theory of heat that you would deduce from them.

18. How is the boiling point of liquids affected by pressure? State the boiling point of water at some pressures greater than that of the atmosphere.

19. Explain the "Spheroidal state" of water, and its importance in relation to engine boilers.

20. Explain the construction and use of either Mason's, Daniell's, or Regnault's hygrometer.

ASTRONOMY.

THREE HOURS ALLOWED.

1. Explain aberration of light, and show its effect on the position of a star.

2. Explain the nutation of the earth's axis, and show its effect on the position of a star.

3. Explain the method of drawing a meridian line at any place.

4. Mention what is known of the nature and motions of double stars.

5. Define parallax, state where it is greatest and how it varies.

6. If the sun's horizontal parallax be $8''\cdot 9$, what is his distance from the earth.

7. If the moon's distance from the earth be 60·2 times the earth's radius, what is the horizontal parallax of the moon.

8. The length of a degree on the earth's surface has been measured both north and south of the equator, and its mean length is about 69·45 miles, what is the Equatoreal radius of the earth?

9. The length of a degree on the earth's surface has been measured far from the equator and it is found that the length of a degree increases from the equator to the pole such that the ellipticity of the earth is $\frac{1}{298}$ nearly, what is the polar diameter of the earth.

10. If the zenith distance north of Polaris be observed at its inferior transit over the meridian be $39° \, 55' \, 51''\cdot 81$, and of its superior be $37° \, 5' \, 19''\cdot 96$; and the corrections for refraction be $48''\cdot 46$ and $44''\cdot 62$ respectively, what is the star's north polar distance, and what is the latitude of the place of observation?

11. Define a tropical year?

12. Define a sidereal year, and determine its length, assuming the length of a tropical year as 365d. 5h. 48m. 51·6s.

13. Define an anomalistic year and calculate its length.
14. Define a sidereal day, a solar day, a mean solar day, and the equation of time.
15. The interval of time from the sun leaving Aries till he returns to it again is 365d. 5h. 48m. 51s., what is the sun's mean motion in longtitude or right ascension in one solar day, and what is the relation between a sidereal day and a mean solar day.
16. Deduce formulæ to convert sidereal into mean solar time, and conversely.
(17.) On February 25, 1860, the observed transit of Castor was 7h. 25m. 22·23s., and the calculated place of the star on this day was 7h. 25m. 42·56s.

The level error was 5″·9, west end of axis too high.

Azimuthal error was 6″·7, east pivot too far north.

Collimation error was 0″·9, correction to stars above the pole subtractive.

The sin. of zenith distance was ·333

The cos. of zenith distance was ·943

The sin. of north polar distance was ·846

What was the error of the clock?

The numerical corrections to the time of observed transit, in seconds of time, are—

$$\text{Error of Collimation} \times \frac{1}{15 \text{ sin. N P D}}$$

and additive when stars above the pole require an additive correction.

$$\text{Error of level} \times \frac{\text{cos. zenith distance}}{15 \text{ sin. N P D}}$$

and additive when the western end of the axis is too high.

$$\text{Error of azimuth} \times \frac{\text{sin. zenith distance}}{15 \text{ sin. N P D}}$$

and additive when the eastern pivot is too far north.

18. The transit of the centre of Jupiter on the same day corrected for error of level, collimation and azimuth was 7h. 7m. 16·82s, using the error of the clock as found from Castor, with a losing daily rate of 0·3s, what was the error of the tables?

The places of Jupiter as given in the Nautical Almanack are—

February 24 at noon 7h. 7m. 53·26s.
" 25 " 7h. 7m. 40·65s.
" 26 " 7h. 7m. 28·87s.

The sidereal time at mean noon on February 25 was 22h. 18m.

19. The zenith distance of the sun's north limb was 69° 44′ 20″·47.

The zenith distance of the sun's south limb was 70° 16′ 41″·64.

The correction for refraction for north limb was 2′ 38″·59, and for parallax was 8″·12.

The correction for refraction for south limb was 2′ 43″·22, and for parallax was 8″·15.

The latitude of the place of observation is 51° 28′ 38″·20.

What was the diameter of the sun, and what was the error of the tables, the calculated place of the sun being, south declination 18° 34′ 21″·10?

20. On November 7, 1861, the calculated place of the moon when she passed the meridian of Greenwich was 109° 46′ 8″·7.

The observed zenith distance of her south limb was 72° 23′ 12″·87.

The correction for refraction was 2′ 59″·84.
" " parallax was 55′ 20″·44.

The semi-diameter of the moon was 15′ 54″·12.

What was the error of the calculated place?

(*To be continued.*)

Fine Arts.

Signor Brucciani, of Russell-street, Covent-garden, has just completed a large and handsome gallery, which he has filled with casts from all the finest remains of antique sculpture. They are the same as those supplied by him to the Science and Art Department, the British Museum, and the Royal Academy. The contents of this gallery consist of statues, statuettes, machine reductions, and copies from the antique, casts from original modern statues and busts, figures for gas lights, statues and portraits of eminent men of all professions; animals, animals' heads, and groups of animals, both antique and modern, relievi, basso and alto, vases, tazzi, and torsi; candelabra and tripods; casts from all the principal parts of the human figure, anatomical studies, fruit, foliage, and flowers in relief, from nature, for the use of artists and students; and ornaments of all kinds for both external and internal decorative purposes.

Winchester City Cross.—A committee has been formed for the restoration of this cross, a work of the 15th century, which has for years been in a state of great dilapidation and decay, three out of the four statues with which it was originally decorated having been destroyed. Mr. G. G. Scott has furnished plans for the restoration of the cross, and has undertaken to superintend the execution of them. He proposes to retain as much of the original structure as may be found practicable, and to restore the whole, as nearly as possible, to what he believes to have been its original state. The sum of £600 will be required to complete the work.

Archæological Institute.—The Warwick meeting of the Archæological Institute has been particularly pleasant and instructive. Excursions were made to Kenilworth, Coventry, Lichfield, and Stratford-on-Avon, where papers were read and explanations given of the objects interesting to the antiquary. In Warwick, the castle first claimed the attention of the visitors; a historic sketch of the building was given by the Rev. C. H. Hartshorne. The company included the President, Lord Leigh, the Bishop of Oxford, the Dean of Chichester, and Mr. Beresford Hope. On entering the suite of rooms which the Earl of Warwick had thrown open, Mr. Scharf gave explanations of the pictures and portraits. The after-part of the day was devoted to an excursion to Stoneleigh Abbey and a visit to the ruins of Kenilworth. The following morning opened with an excursion to Coventry; the Mayor received the excursionists at St. Mary's Hall, which had been richly stored as a museum in honour of the visit. The city boasts of ancient archives and of certain pieces of municipal plate of rare historic interest. Leaving the hall, the party made a peregrination through the singularly picturesque streets of this commercial city of the middle ages. The remains of the cathedral, now consisting of little more than a substructure, were visited. There is little doubt that it formerly possessed three spires, and these added to the three church spires for which the city is still conspicuous, must have added much to the beauty of the city. Mr. Beresford Hope, in the choir of St. Michael, made some interesting remarks on the leading architectural features of that imposing church; spacious it was, and commanding, as fitted for a large and wealthy commercial community, and the choir was probably formerly used for the performance of the Coventry "mysteries." On Friday there was an excursion to Lichfield, where Professor Willis delivered a discourse upon the architectural history of the cathedral, and Mr. Winston read a paper upon the windows in the Lady Chapel. Professor Willis gave to his hearers an exhaustive analysis of the venerable cathedral, tracing the successive stages of its history. The paper read by Mr. Winston on the windows of the Lady Chapel, was remarkable for its advocacy of the style of the Renaissance and its defence of the Munich school of painted glass, as opposed to the more archaic, severe, and architectonic manner of anterior centuries. During the excursion to Stratford the house and grounds of Charlecote were visited. The house was kindly thrown open by its present owner, H. L. Lucy, Esq. On reaching Stratford, the mayor, the rector, and Mr Halliwell conducted the party from the birth-place to the

resting-place of Shakspeare. The Institute closed its proceedings on Tuesday, by a general meeting in the court-house of Warwick.

Schools of Art.—The Committee of Council on Education have decided that the present minutes relating to art instruction shall continue in operation up to the 31st March, 1865, as respects existing schools of art; and inquiry will be made as to the feasibility of establishing night classes for instruction in drawing to artisans in connection with Mechanics' and other Institutions and Schools not organised as distinct schools of art. During the recess the recommendations of the Select Committee of the House of Commons on Schools of Art will be taken into consideration.

Fine Arts in France.—The number of provincial exhibitions is increasing every year, exhibiting a growing taste for the arts amongst the provincial populations; the exhibitions of Angers, Melun, and Nancy were recently closed; that of Bayonne opened on the 10th July, and is announced to close on the 30th September; the Boulogne Exhibition opened on the 1st of July, and is to close at the end of the present month; that of Falaise commenced on the 14th July, to close on the 25th inst.; and the following are announced:—Marseilles, to open the 1st of September; and Rouen on the 1st of October. The Exhibition of Boulogne sur-Mer contains 425 works and includes the productions of some of the most popular painters in France. The improvements which have occurred at the Louvre have greatly increased the number of visitors to that famous gallery; on Sundays the rooms are crammed; and on Tuesdays and Thursdays the average is between 1,500 and 2,000. The antiquities of the Campana collection are to be given to the public on the 15th inst., the day of the Imperial *fêtes*. The French school is now exhibited to great advantage, and its beauties and defects may be seen with a facility that it has never before enjoyed. The galleries of the Luxembourg attract at the present moment about 500 visitors on Sundays, from 200 to 300 on Thursdays, and on ordinary days from 100 to 150. The number of students and copyists in the various galleries increases daily; from 40 to 50 artists may be seen almost daily at work in the Salle des Dessins de la Bibhothèque alone.

Decorations of St. Paul's.—The ceremony of uncovering the first of the mosiac paintings in St. Paul's Cathedral, forming part of the intended embellishments of the interior, took place lately in the presence of the Committee for raising funds for this purpose. The mosaic was designed by Mr. Alfred Stevens, and carefully executed by M. Salviati, of Venice. It is placed in one of the eight spandrels formed by the great arches of the dome, under the whispering-gallery, and occupies a space of nearly 300 superficial feet. The design is intended to represent the Prophet Isaiah in a vision, with two attendant angels, and is one of a series of groups with which it is proposed to adorn the eight spandrels in that part of the edifice illustrative of the prophets. It represents the prophet seated, and turning half round towards the right, as if scanning some mystery which is indicated by a tablet held by an angel, while on the left another angel exhibits a separate revelation. It is executed on a gold ground, which greatly enhances its effect, and has occupied M. Salviati two months, the cost being about £700.

Manufactures.

Bleaching of Sponges.—A French savant, M. Artus, has been experimenting on the bleaching of sponges. Some good sponges were well washed by M. Artus in river water, and whilst still wet were placed in a bath of six parts water and one part commercial hydrochloric acid, and were allowed to remain until all the carbonic acid gas was discharged. They were then washed again, and afterwards strung together and immersed in hydrochloric acid, diluted with six per cent. of hyposulphite of soda dissolved in water. The vessel was then closed, and left for forty-eight hours, when the sponges were taken out, washed and dried. M. Artus tried another experiment, in which the quantity of hyposulphite of soda was doubled. In a third experiment the sponges were, on removal from the bath, treated with hydrochloric acid, subsequently well washed, and then exposed to sulphurous acid gas. The sponges, however, by each of these processes were not thoroughly bleached, and a fourth method was tried. The sponges were well washed in hot diluted soda lye, then placed in a bath of weak hydrochloric acid and hyposulphite of soda, using only half the quantity of hyposulphite that was used in the first experiment, and a very satisfactory result was thus obtained.

Cosmetic Poisons.—In France, as in all civilised countries, the use of cosmetics is very great, and the mischief caused thereby enormous. Frequent cases of serious illness, permanent injury, and sometimes of death, caused by these compounds, which are quaintly described in the *Dictionnaire Universelles de Matière Médicale* as "destined to give to the face and body a beauty which they do not possess," are not sufficient to deter persons from recurring to all kinds of aids to beauty in the shape of powders, creams, washes, and dyes. MM. Chevalier and Trébuchet, both members of the sanitary council of Paris, have upon more than one occasion protested against the negligence of the administration which permits matters so injurious to the health as the great mass of cosmetics to be offered for sale, and to be puffed into notoriety by false statements and deceptive recommendations. Sometimes the law visits with its penalties the makers and salesmen of these poisons. In 1860, two perfumers sold pearl white to a number of actresses, who soon exhibited symptoms of having been poisoned; they fell into a condition of extraordinary languor, they lost their memory; their minds became affected, and their hands and arms became puffed and swollen. One of them was very nearly losing her life. The matter was carried before the tribunal of correctional police; the preparations were analysed and found to contain considerable quantities of carbonate of lead, and the two perfumers were each imprisoned for three months and fined £20. There have been several other remarkable cases of the like kind, though none, perhaps, so striking as the above; and the scientific men of France have made many praiseworthy efforts to enlighten the public mind on the subject. Amongst others M. Réveil, a distinguished chemist, has published a work on cosmetics, in which the tricks of the perfumer are laid bare in a determined manner. The use of cosmetics is unusually large in Paris, and the business of the perfumer and the quack—not of necessity, but too often united in one—is carried out on a large scale, but the warnings which have been published in Paris are equally applicable to London. It is right that English as well as French ladies should know that of all the ordinary cosmetics violet powder (*Poudre de riz*) is one of the most innocent, and that even the substances with which it is sometimes, if not often, adulterated, namely, plaster of Paris and talc, are not injurious to the general health, whatever may be their effect upon wrinkling the skin and rendering it coarse in appearance. The powders and washes sold for the removal of superfluous hair are declared to be highly dangerous, containing, as they do, mercury, arsenic, oxide of lead, quicklime, and caustic soda, all deleterious. An actress of the Vaudeville Theatre suffered severely from the use of one of these powders, it having produced deep and painful wounds; it was found on analysis to contain quicklime and caustic soda. One of the depilatory fluids best known is the rusma, which is used by the Orientals; this is simply quicklime and sulphite of arsenic boiled in an alkaline solution. To give an idea of the character of this compound, and of the effect it must have upon the human skin, it may be mentioned that the mode of testing the strength of the rusma is to dip a quill into it, and if the feathers do not

fall off the stem the rusma is not fit for use as a cosmetic! In the time of Louis XIV. and XV. the barbers used to have two or three baths to let to their customers; there were no large bathing establishments in Paris, on the Seine or elsewhere, till about 1761, and it was the custom to rub the bather over with depilatory paste, the composition of which was fixed, by law, as follows:—4 ounces of quicklime, $1\frac{1}{2}$ oz. of orpiment, and 2 pounds of lye made from bean stalks. The *lait antéphélique*, which is so strongly recommended for removing freckles, is simply a preparation of corrosive sublimate, one of the most virulent poisons known. Amongst the most dangerous cosmetics known in Paris are the common white and red pastes used in the theatres; the first is composed with white lead, the second with sulphite of mercury. The liquids sold by perfumers for dyeing the hair consist of red lead, chalk, and slacked lime. The preparations sold for the same purpose under the high-sounding names of Eau de Perse, Eau d'Egypte, Eau de Chypre, Eau d'Ebène, are generally only concentrated solutions of nitrate of silver. M. Trébuchet says:—"The sale of cosmetics is a matter of extreme danger, and an efficacious remedy is imperatively called for; at no epoch was the public credulity more abused. The evil is extensive, but fortunately not incurable, and the authorities are sufficiently armed without the passing of any new laws. The moment that a cosmetic is announced as having medicinal or prophylactic qualities; the moment it appears to include a secret remedy, it falls under the law expressly provided for such cases. The means of repression exist; it only remains to study how to apply them and to have the courage to put down an abuse when it appears." Some years since the sanitary council of the Seine gave its attention to the use of dangerous matters by the confectioners for tinting their sweatmeats, and now, in consequence of the periodic visits of the members of the council, the confectionary of Paris is almost, if not quite, purified from these deleterious substances. Why, it is asked, is not the same rule applied to perfumery? It is a matter decidedly affecting the health of the public in a high degree, and well deserves the trouble that it would entail upon the authorities. It is almost needless to add that all that is here recorded, and all that is proposed to be done in Paris, applies, in one sense in a greater, though in another in a less degree, to London; the use of cosmetics cannot be put down by the law, but the abuses of quacks may at any rate be exposed, and the public put upon its guard.

COTTON.—The cultivation of cotton is attracting much attention in the state of Yucatan. In 1862, the amount exported was only 240,000lb. The prices obtained in the Havannah and elsewhere, however, were so renumerative that several landed proprietors determined to turn their attention to the subject, and the consequence was that in the following year 1,200,000lb, were exported, and this year it is expected that the produce will nearly reach 3,000,000lb.

CLOTH-SHEARING MACHINE.—M. Alcan, member of the Mechanical Committee of the Société d'Encouragement of Paris, has published, in the bulletin of the Society, an account of a discovery of a MS. by Leonardo da Vinci, in which he describes and illustrates, by sketches, an invention of a machine for shearing cloth. It is well known that the great painter of the *renaissance* was not a painter merely; his name has been associated with a variety of scientific researches and mechanical appliances, and an account of them is given by Venturi, in "*L'Essai sur les Ouvrages Physico-Mathematiques de Leonard de Vinci*," and by the author of a work entitled, "*L'Histoire des Sciences Mathematiques en Italie depuis la Renaissance des lettres jusqu'à la fin du XVII. siècle.* M. Alcan was struck by the following passages from the latter work, having reference to Da Vinci's labours:—"We shall notice many machines for making cylinders, files, saws, shearing cloth, rabetting, reeling; a mechanical press, a hammer for goldbeaters, a machine for digging ditches, another for tilling the ground by means of water power, boring apparatus, a paddle for moving boats, and an infinity of other machines too numerous to mention. He also had constructed a number of ingenious apparatus for domestic purposes, and had conceived the idea of a smoke-jack for turning the spit." This passage seems to have excited M. Alcan's curiosity, and after much inquiry he learnt that these inventions were described in MSS., some of which, originally deposited in the library at Milan, had been taken from thence after the Egyptian campaign by the First Consul, and deposited in the private library of the Institute of France. There he has found three MSS., which contain, in addition to written descriptions, sketches of the inventions drawn in pen and ink by Da Vinci himself. M. Alcan was specially struck with the sketches of the cloth-shearing machine, and has had fac-similes of them printed and inserted in the Society's Bulletin. There are seven sketches in all, and they exhibit a machine with cutting blades wrapped round a cylinder after the fashion of a screw. The cylinder lies transversely on the cloth, and has a double motion, one of rotation on its axis, the other of translation along the length of the cloth, which is stretched beneath it. The machine bears a remarkable analogy, indeed is almost identical with, the first automatic shearing machines, known as transverse machines, working over the cloth which remained fixed. Such machines were known in England under the name of Lewis's, and in France under that of Collier's, who first imported them into that country. Previous to the commencement of the present century, all the woollen cloths were sheared or cropped by hand, and machinery for the purpose was not introduced into the manufacture till about the year 1802.

Commerce.

FISHERIES OF FRANCE.—The admirable exertions which have been used in France for the artificial propagation and preservation of fish, are about to be seconded by the promulgation of a new law relating to fisheries. One of the provisions of this draft law is in accordance with the practice in England, and with the representations which have been made on the subject by the English to the French government, and prohibits the taking and selling of fish during the spawning season. In the original draft adopted by the commission appointed to draw up the bill, this clause referred only to salmon and trout, but the Minister of Agriculture and Commerce consulted M. Coste, Inspector-general of river fisheries, to whose skill and energy is due the great fish preserve at Concarneau, described in the Society's *Journal* of the 29th July, who of course advocated the application of the interdiction to all kinds of fish, the preservation of which is a matter of public importance, and the bill has been altered accordingly. To save is always more easy than to create, and the value of this decision is of infinite importance.

QUINQUINA.—The French are about to undertake the cultivation of the Quinquina in the oasis of Ghauna, in Algeria.

COTTON.—Messrs. Smith, Edwards, and Co., in their circular for August, say:—"The great basis of strength to our market consists in the prospective scarcity of supply, for as the season progresses it becomes more apparent that the present rate of consumption, and an export demand slightly in excess of last year, cannot be maintained without leading to a considerable reduction in stock before the end of the year. The shipments from Bombay in the fortnight ending the 8th July, were only 15,000, and for several months they will be small, owing to the prevalence of the monsoon—probably not larger than last year, when they averaged 25,000 bales fortnightly—and though they will likely be heavy during the last three months of the year, these shipments will not come into this year's supply. It does not seem probable that we shall receive a large increase of long-staples over the

same period last year, as there is little Brazil cotton afloat, and the Egyptian crop is now almost exhausted. We shall have pretty liberal arrivals of new crop Mediterranean cotton in November and December, but the experience of past years teaches us that we cannot expect any weight of this cotton before January. The position of Manchester is still extremely healthy, no accumulation of stock is taking place, and a good demand for the home trade and export steadily takes off the present production. The accounts from the East, though less encouraging than the latest dates, show that India is responding to the movement here, and better news is confidently expected. The position of the trade, looked upon in the light of supply and demand, is strong, and would seem to warrant a higher range of prices during the autumn; but this may be more than counterbalanced by the course of American affairs."

The Timber Trade between France and Norway has progressed of late. In 1863 the quantity of sawn timber, for building purposes, imported direct into France from Norway, was 123,404 steres (the stere is rather more than 35 cubic feet) of one sort, and 19,162,314 metres (the metre is rather more than 3 feet 3¼ inches) of another sort; whereas in 1862 the quantities respectively were only 112,645 steres and 15,842,544 metres. In the first five months of the present year the import of the former sort was 60,319 steres to 52,685 in the same period of last year; and of the other sort 6,955,563 metres to 2,327,162. In other descriptions of timber there is likewise progress. The port of Dieppe has obtained a fair share in the trade, and is making great efforts to increase it.

Imports from France.—It appears from a parliamentary return that the value of the linen manufactures, viz., cambrics and French lawns, damask and damask diaper, sails and sailcloth, &c., imported into the United Kingdom in the year ended May 31, 1863, was £55,934. In the year ended the 31st of May this year the total value of the imports was £211,949. The great increase is in linen yarn.

Colonies.

The Gold of New Zealand.—A return of the quantity and value of gold exported from New Zealand from 1st April, 1857, to 31st December, 1863, has been issued. Otago has exported during the quarter ending 31st Dec., 1863, 131,601 ozs. of the precious metal, of the declared value of £509,953, exclusive of the following quantities from Invercargill and the Bluff, which were the produce of Otago, viz., 3526 ozs. and 458 ozs. respectively, of the value together of £15,438. The total quantity exported from Otago now amounts to 1,201,536 ozs., the money value being set down at £4,665,565. From the same return it appears that Nelson (of course exclusive of the products of the late discoveries) has exported a total quantity of 61,828 ozs., valued at £239,583; and Auckland has exported 6073 ozs., of the value of £19,329.

Gold Dust.—The quantity of gold dust imported into the Sydney Branch of the Royal Mint, from the 1st Jan. to the 28th March, for the purpose of coinage, has been 115,427 ozs., and the amount of gold issued has been 324,000 sovereigns. For the same period of the year 1863, the receipts of gold dust amounted to 119,050 ounces, and the coin issued to 358,000 sovereigns. The difference in the gold dust received for coinage, as compared with last year, is only 3623 ounces, and in the coin issued 34,000 sovereigns; but this is owing to the fact that two or three parcels of gold dust have been recently received from Victoria, and not to any improvement in the yield of the gold fields, which still show a considerable falling off on the receipts of last year.

Tobacco in New South Wales.—The tobacco plantings in this colony are said to have fully realised the expectations of several owners.

New Zealand Revenue.—The Customs returns of the value of imports and exports for the quarter ending March 31, shows that the imports amounted to £870,418, of which £373,808 was from Great Britain and £353,813 from Victoria. The value of exports for the same period was, the produce of New Zealand, £688,009 1s. 7d.; other countries, £13,242; total, £701,251 1s. 7d.

Agricultural Machinery in New Zealand.—There are now at the Taieri and Tokomairiro alone some six or seven steam thrashing machines, besides those which are worked by horses. Some of the former are portable, and may be hired by the day, at so much per bushel of grain. The demand this season is larger than usual for chaff-cutters, winnowing machines, and corn-crushers.

Peak Downs Copper Mine.—A Sydney paper says that the last accounts from this mine report that smelting operations had commenced, and that the ore turned out to be a very rich metal. Three of the shafts that have been opened disclose the existence of several thousand tons of ore of good per centage, all of which can be raised at a trifling cost.

The Population of Tasmania, on the 31st of December, 1863, was estimated at 91,519. The estimated population on 31st December, 1862, was 49,441 males, 41,682 females, less 395 children, whose sexes have not been distinguished. Total population on that date 90,728; increase during the year 1863, by arrivals, 3,621, and by births, 2,998; total increase, 6,619; decrease by departures, 4,410; by deaths, 1,410; total decrease, 5,828. These figures show an actual increase in the population of 794 souls.

Obituary.

John Morton, of Nailsworth, Gloucestershire, one of the original members of the Royal Agricultural Society of England, and agent for many years over the estates of successive Earls of Ducie, died on the 26th July, aged eighty-three. A quarter of a century ago he established, on Lord Ducie's property, the Whitfield Example farm, which at one time received large numbers of visitors, inquiring into the results of the land drainage, and of the management which he there superintended and directed. He also first attempted to illustrate the connection existing in this country between agriculture and geology. In early manhood—already, however, in the occupation of a small farm in his native county, Fife—Mr. Morton repeatedly walked over most of the counties of England. His notes on the geology and farm practice of the districts thus examined were afterwards collected and published in his book "On Soils," and this, as the work of an original observer, was cordially introduced to the agricultural public by the late Dr. Buckland and the late Philip Pusey, M.P., and went through several editions during 1840-1848. He also wrote a controversial pamphlet along with his friend the late Joshua Trimmer, F.G.S., advocating the repeal of the corn laws from the agricultural point of view, on the ground that the farmer is or ought to be one of the largest consumers of grain in the right prosecution of his business—a truth which, though not generally admitted at the time, has since then been more and more realised. Early in the century Mr. Morton left Fifeshire, and took a farm near Dulverton, in Somerset; and, through the introduction of his landlord, the late Earl of Carnarvon, he was ultimately placed in charge of Lord Ducie's Gloucestershire estates. He retired at the age of seventy, and had latterly resided at Morningside Cottage, Nailsworth. He was the father of Mr. John Chalmers Morton, the well-known writer on agricultural subjects, and now Examiner in Agriculture to the Society of Arts.

Publications Issued.

The Story of the Guns, by Sir Emerson Tennant (*Longman*).—The author divides his book into three distinct parts:— The Rifled Musket — The Rifled Ordnance—and the Iron Navy. In the first of these he commences by describing the inefficiency of the regulation musket formerly in use, and questions whether, "without the invention of the bayonet, the musket of the last century would have permanently succeeded the cross-bow of the middle ages." He continues by describing the manner in which the musket was tested, and the ridiculous results obtained, and states that, not long ago, a well-trained marksman, using a regulation musket, could not put more than one bullet out of twenty into a target 18 feet square, the range being 300 yards. He repudiates the obstinacy of the Duke of Wellington in not adopting a new form of musket, and gives reasons for his reluctance to introduce a new arm, until the introduction of the Minié rifle was sanctioned in 1851. Starting from this, as the commencement of gradual improvement, he enters into a description of the carabine à tige, Minié, and Enfield bullets. Referring to the Enfield rifle of 1853, he says:—"During the ten years that have elapsed since its adoption, although other rifles made in England have greatly exceeded it in almost every essential quality, it admits of no doubt that the Enfield rifle is still superior to any arm yet adopted in other countries, and its efficiency was well attested at the Alma and at Inkermann, where, in the words of the *Times*' correspondent, 'it smote the enemy like a destroying angel.'" Mr. Whitworth is then brought into notice, and the experiments which led to the production of his well known rifle are referred to. In 1857 Mr. Whitworth reported to the Secretary of State for War his ability to communicate such velocity, by means of polygonal rifling with a quick turn, as effectually to control the tendency to "turn over" in projectiles of any length. The progress is now described as rapid. Mr. Whitworth adopted a ball of a cylindro-conoidal or hexagonal shape, and after a series of experiments the unknown secret was disclosed. "The unknown principle was found to consist in an improved system of rifling; a turn in the spiral four times greater than the Enfield rifle; a bore in diameter one-fifth less; an elongated projectile capable of a mechanical fit; and last, not least, a more refined process of manufacture." In consequence of the data derived from his rifled musket, Mr. Whitworth predicted, in 1857, what he effected in 1860-62, and said that "Projectiles of wrought-iron steeled might be made for pieces of ordnance capable of penetrating the sides of floating batteries protected by iron armour." The first part concludes with a summary of the events which have since occurred in relation to the Enfield and Whitworth rifles, and with the objections opposed to the Whitworth rifle by the Ordnance Select Committee. In the second portion of this work, which treats of rifled ordnance, Sir E. Tennant starts by running through a list of men who first rifled cannon. He says—"The idea of rifling artillery was far from being new; it had been tried in Germany more than a century before our time, and Robins, the accomplished inventor of the 'ballistic pendulum,' for determining the relative velocity of projectiles, experimented on rifled field-pieces in England so far back as 1745." M. Ponchara (1819) at Paris, and Montigny (1836) at Brussels, had attempted similar experiments. Colonel Cavalli in Sardinia, and Baron Wahrendorf in Sweden, experimented on rifling combined with a system of breech-loading. Between 1840 and 1852 Colonel Treuille de Beaulieu endeavoured to revive the subject in France, but it was not till 1854 that Napoleon directed that experiments should be made on rifled cannon. Mr. Lancaster's gun is then brought before us, "the chief peculiarity of which consisted in its having an oval or slightly elliptical bore, with an increasing rapidity in the twist as the spiral approached the muzzle of the gun." This gun was used in the Crimea, but of eight sent three burst, chiefly on account of their being old cast-iron guns bored for the occasion on the Lancaster system. After Mr. Lancaster we are told that Mr. Bashley Britten and Mr. Lynall Thomas patented guns in 1855, and our attention is called to the guns of Mr. Jeffery, Mr. Hadden, and Commander Scott, who adopted numerous modes of rifling. In 1858 the committee on rifled cannon report on seven guns submitted to them, and placing those of Armstrong and Whitworth in a class by themselves, consider it unnecessary to conduct further experiments with the remaining five. In 1863, when the report was made, they awarded the first place for rifling to Mr. Bashley Britten, on the ground of the small strain on the gun caused by his projectile. "Captain Blakely's system has not as yet been favourably regarded by the British Government, and although after evidence of its performance in 1855, two experimental guns were ordered by the War Office, some considerable time elapsed before they were tried at Shoeburyness." . . . . "The first gun, however, which Capt. Blakely produced in 1854, underwent a competitive trial with a cast-iron gun and a brass one, both in use in the service, in the course of which the cast-iron one gave way, after 351 rounds, and the brass one after 479; whilst the Blakely stood 3,389 shots." The Mersey Company manufactured the Horsfall gun, which is a grand piece of forging; it weighs 24 tons and has a bore of 13 inches. Its performance is thus related:—"On the 16th September, 1862, it was laid at a range of 200 yards, and with a charge of 75lb of powder it sent a solid, cast-iron projectile, weighing 280lb, with a velocity of 1,100 feet in a second, through the central plate of a target formed of 18 inches of teak covered by 4½ inches of iron and lined with one inch of the same." At long ranges its accuracy was found to be inferior to its power. Sir William Armstrong and his gun are then made the subject of a chapter. After brief allusion to his crane and hydro-electric machines, Sir E. Tennant tells us that Armstrong was among the first to see the necessity of imparting to field artillery the accuracy and range of the rifle. Encouraged by the Duke of Newcastle, Armstrong puts together his first gun in 1855. In November the same year the War Office Select Committee report favourably and recommend experiments on a larger scale to be made on Armstrong's gun. In 1858 an 18-pounder called forth the praises of Colonel Mitchell, of the Royal Artillery, and Lord Panmure, and a 12-pounder and two 18-pounders were ordered for experiments. At the close of 1858, the Armstrong gun for special service in the field was adopted. An accurate description of the gun, its manufacture, system of rifling and projectiles, conclude the chapter. The chapter following is given up to Mr. Whitworth's gun. Mr. Whitworth first rifles some field brass guns, and these were reported on favourably; his attention then became turned to heavy guns, and he bored and rifled three brass blocks for 24-pounder howitzers. The extraordinary range of these, and the singular property of one of them in maintaining its *direct course* under water, called forth general attention. The 3rd division of this book gives us a history of iron plates, and recounts the efforts of the Admiralty to impose impregnable obstacles to the new rifled ordnance. The effect on the different kinds of shot when fired at some of the targets is interesting; but the account of the immense amount of controversy and diversity of opinions is more a matter of history than an aid in learning truths about guns or armour.

Notes.

The Prince Consort's birthday, on the 26th August, is to be kept as a holiday at the Royal Horticultural Gardens, South Kensington, which are to be open free to the public, at the express wish of the Queen.

French Expedition to Mexico.—Messrs. Guillemin and Coignet, civil engineers, have been attached to the scientific staff sent by the French government to Mexico. This department undertakes the exploration of the metalliferous districts and mineral substances of that country.

Archæology.—An inexhaustible mine of antiquities has recently been discovered in the ruins of Lambèse (Africa). A sepulchral vault, believed never to have been opened, has been discovered at about two hundred yards from the Prœtorium. In it were found, amongst other things, two sarcophagi, bearing the names of a husband and wife, whose remains had been deposited therein, and each supported by two lions' heads sculptured. The lids were intact, and the skeletons lay perfectly embedded in beds of extremely fine clay. There were vases and medals discovered, and the following quaint epitaph, translated by M. Barnéond, the director of the Penitentiary at Lambèse:—"In memory of the Veteran Caius Aemilius Victor, who during his lifetime built and dedicated this hypogeum for himself and his wife, at the cost of 4,000 sestertiœ," about £24. A letter from Athens, addressed to the President of the Imperial Institute of Geologie of Paris, says that Dr. de Hahn, with thirty-six workmen, made an excavation at Baligdah, the supposed, or rather one of the supposed sites of ancient Troy, and these laid bare the whole Cyclopean wall of the castle or citadel. No sculpture was found, says the letter in question, but some Greek coins, lamps, and remains of figures in terra-cotta. The walls of the supposed acropolis were covered with vegetable mould to the depth of about thirteen feet. It is said also that the remains of another ancient citadel have been discovered opposite Baligdah, near Scamandre, and that excavations are going on there at the present moment.

Patents.

From Commissioners of Patents Journal, July 29th.

Grants of Provisional Protection.

Air and smoke valve—1757—T. Boyle.
Alarum for railway trains—1767—J. Clark.
Anchors—1700—S. Sharp.
Animal charcoal, apparatus for re-burning—1727—S. Carey.
Bolts, &c., machinery for making—1746—J. Lewis.
Brewing, improving water for—1695—A. Blake.
Carding and combing fibrous and textile materials—1581—A. Knowles and J. Barraclough.
Carding engines, machinery for grinding card cylinders of—1702—J. Middleton and J. Coulong.
Carriages—1721—W. E. Gedge.
Carriages, &c., propelling on inclines—1683—E. M. Marsden.
Chaff-cutting machines—1736—W. Barford, E. Pope, & S. Bradford.
Chain bands—1488—J. Lancelott.
Coffins—1744—V. Pean and A. F. Legros.
Collecting apparatus (money or tickets)—1748—E. Kerruish.
Cop tubes, machinery for applying to spindles of mules—1745—E. Kirby.
Cutlery bolsters—1715—T. McGrah.
Distilling apparatus—1705—J. J. Moutié.
Distilling liquids—1732—J. Forbes.
Earth or soil raising and conveying machinery—1738—W. Wood.
Envelopes—1771—D. B. Grove.
Envelopes, &c., securing—1733—J. Tomlinson and T. Brassington.
Explosive compounds—1813—W. E. Newton.
Feathers and plumes, artificial—1690—P. S. de Pinna.
Fibrous materials, machinery for spinning—1763—T. Lancaster, J. Lancaster, and J. Whitaker.
Fibrous materials, machinery for treating—1743—W. L. Wise.
Fibrous substances, machinery for preparing—1769—W. K. Westly.
Fire-arms—1811—W. H. Wilks.
Fire-arms, breech-loading—1785—A. Wyley.
Fire-bars, &c., for cooking stoves—1640—J. Plimsaul.
Fuel, manufacture of—1714—J. W. Horsfall.
Furnaces, supplying fuel to—1701—A. Rogers.
Gardens, instrument for protecting from birds—1765—W. C. Thurgar.
Gas, purification of—1759—A. A. Croll.
Go-carriages for teaching children to walk, &c.—1604—J. Askew.
Grain and seed screening machinery—1739—J. Francis.
Grass rollers—1722—T. Amies, W. Barford, and E. Pope.
Gunpowder—1694—L. H. G. Ehrhardt.
Guns and ordnance—1807—G. P. Harding.
Hair and flesh brushes—1726—B. Greenwood and I. Underwood.
Harmoniums, &c.—1750—J. Gilmour.
Hats (ventilating)—1572—J. Smith.
Iron, manufacture of—1795—F. Seebohm.
Lamps—747—J. T. Stroud.
Lead, smelting and refining—1686—J. H. Johnson.
Letter balances—1781—E. Butes.
Liquids, apparatus for measuring flow of—1718—A. V. Newton.
Locomotive apparatus, land and marine—763—J. Symes.
Looms—1712—J. Webster.
Looms—1716—D. Stuttard.
Looms—1803—J. Maynes.
Metallic screw nuts, machinery for manufacturing—1740—W. Spence.
Metal tubes, apparatus used when drawing—1751—B. Smith.
Motive power, apparatus for obtaining—1741—T. T. Coughin.
Motive power by expansion and contraction of air—1809—J. Laubereau.
Ornamentation by means of metallic surfaces—1734—W. Clark.
Paints, manufacture of—1709—G. W. W. Webbe and F. Cant.
Pianofortes—1662—J. W. Jones.
Pigments, manufacture of—1729—L. Schad.
Pipe wrench, self-adjusting—1747—G. W. Pitcher.
Piston-heads and packing—1699—G. Haseltine.
Plastic materials, treatment of—1723—F. L. H. Danchell.
Portfolios—1737—G. O. Wray.
Presses—1707—R. A. Brooman.
Pressure guages—1749—W. Weild.
Railway brake—1696—E. J. Dixon.
Railway carriages—1752—C. Claxton.
Railway chairs—1725—Z. B. Smith and J. Richards.
Railway signals—1787—Z. B. Smith and W. L. Nelson.
Railways, permanent way of—1717—J. E. Billups.
Railways, permanent way of—1793—C. Askew.
Reaping and mowing machines—1687—H. Crichley.
Reaping and mowing machines—1697—A. C. Bamlett.
Reaping machines—1775—P. Winton.
Rifle shooting, calculating distances in—1779—T. Wickam.
Sails, apparatus for reefing, furling, &c.—1689—W. Smallwood.
Saws, apparatus for sharpening—1724—J. Robinson.
Sleeve links, &c., lever fastening for—1742—W. Parsons.
Steam-boats, machinery for propelling—1728—W. Hadfield.
Steam hammers—1693—E. H. Carbutt and W. Cutts.
Steering apparatus—1684—H. E. Skinner.
Stone-dressing machinery—1797—P. G. B. Westmacott.
Stretchers, &c., apparatus for suspending from shoulders of bearers—1698—G. Russell.
Tanning—1691—J. Wilson.
Thrashing machinery—1713—M. Meisel.
Ticket-holder—1801—A. Dalzell.
Umbrellas—1777—J. Weeks.
Under-shirts—1783—W. Tillie.
Veneering machinery—1719—J. Stickland.
Ventilator—1710—T. J. J. Greer.
Washing machines—1692—C. H. Collette.
Washing machines—1791—W. Whitley.
Well-boring machinery—1753—P. Maitland.
Wheels and axles—1703—E. Leahy.
Window blinds—1735—A. Bosch.
Wool-combing machinery, brushes for—1674—E. Clifton.
Woven fabrics, stretching and finishing—1711—W. E. Gedge.

Patents Sealed.

269. W. N. Hutchinson.	341. B. Todd.
280. J. and C. Hawkins.	342. A. M. Perkins.
282. A. B. Childs.	344. T. S. Cressey.
283. E. Beanes.	351. M. C. de Casteras Sinibaldi.
294. G. H. Holloway.	356. R. Smith.
302. M. A. F. Mennons.	387. P. A. Le Comte de Fontainemoreau.
315. W. Taylor, W. Molineux, and H. Harrison.	555. T. Grace.
320. M. C. de Casteras Sinibaldi.	679. J. Griffiths and J. Jaffrey.
328. N. McHaffie.	1345. P. Deeley.
337. R. J. Cunnack.	

From Commissioners of Patents Journal, August 2nd.

Patents Sealed.

297. T. Newton.	454. E. A. Cotelle.
303. J. C. Dickinson.	461. H. Batt.
307. R. Owen.	533. E. H. Bentall.
308. R. A. Brooman.	547. W. E. Newton.
309. R. A. Brooman.	552. A. Manbré.
310. Sir J. S. Lillie.	568. W. E. Newton.
316. A. McLaine.	580. W. E. Newton.
324. J. T. Oakley.	728. F. L. Roux.
325. R. H. Napier.	908. J. Ferrier.
331. E. Welch.	924. J. C. Rohrbeck.
354. W. Hawthorn.	1084. J. C. Browne.
359. J. H. Johnson.	1331. H. A. Bonneville.
363. P. A. L. de Fontainemoreau.	1426. F. H. Warlich.
416. C. Field.	1481. G. H. Hooker.
	1536. H. A. Bonneville.

Patents on which the Stamp Duty of £50 has been Paid.

1879. J. H. Johnson.	1902. J. M. Hart.
1885. J. Robertson.	1892. C. C. J. Guffroy.
1899. T. S. Cressey.	

Patents on which the Stamp Duty of £100 has been Paid.

2052. O. H. Smith.	2113. W. C. Cambridge.
2111. C. Iles.	

THE
Journal of the Society of Arts,
AND OF
THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, AUGUST 12, 1864. [No. 612. VOL. XII.

TABLE OF CONTENTS.

PROGRAMME OF THE EXAMINATIONS FOR 1865.

PRELIMINARY NOTICE.

I. The Examinations described herein have been established for the benefit of the members and students of Institutions in union with the Society of Arts. Such persons are commonly mechanics, artisans, labourers, clerks, tradesmen and farmers in a small way of business, apprentices, sons and daughters of tradesmen and farmers, assistants in shops, and others, of various occupations, who are not graduates, undergraduates, nor students of a University, nor following nor intending to follow a learned profession, nor enjoying nor having enjoyed a liberal education. To all such members and students, and persons of the like condition, male and female, not being nor having been professional teachers or pupil teachers, the Examinations, certificates, and prizes, described in this programme, are open on the general conditions stated herein. Persons who are, or have been, professional teachers, or pupil teachers, may obtain certificates, but cannot compete for prizes*.

II. The certificates are not competed for. They are awarded as records of positive not comparative attainment. The prizes are competed for.

III. For the conditions on which persons of a higher grade in society may be examined and receive certificates, but not compete for prizes, see par. 10, (D).

IV. The candidates for Examination have not to go to a distance from their homes. The Examinations are held in all places in the United Kingdom where a Local Educational Board connected with the Society of Arts is willing to make the requisite arrangements.

V. For a list of the Local Boards already formed see page 627.

VI. For instructions as to the formation of Local Boards and their duties see page 621.

The EXAMINATIONS are twofold—

(1.) The Previous Examinations by District Unions and Local Boards for persons of any age not under 12.

(2.) The Final Examination by the Society of Arts' Board of Examiners, under the supervision of the Local Boards, for persons of any age not under 16.

PREVIOUS EXAMINATIONS BY DISTRICT UNIONS AND LOCAL BOARDS.

1. These are intended to serve two purposes:—

(1st.) To "sift" the Candidates for the Final Examination, so as to keep back those who, not being yet fairly grounded in the elements of education—spelling, writing, and arithmetic—nor fairly acquainted with the subject or subjects in which they desire to be examined by the Society of Arts, are unlikely to succeed in that Examination. The sifting in elementary subjects may be effected in any mode at the discretion of the Local Boards; but they are recommended (for the sake of convenience and uniformity) to adopt the "Scheme of Elementary Examinations" given below. The best mode of sifting the Candidates in the subjects in which they desire to be examined by the Society of Arts is for the Local Boards to examine them therein by means of printed (or written) questions and written answers; but, where a Local Board finds itself without the means of conveniently holding such an Examination in any special subject, such Board may satisfy itself in any other mode, and state simply that it has satisfied itself, that the Candidate is fit to be examined by the Central Board in that subject.

2. (2nd.) To encourage and lead on those who, from the insufficiency of their age or of their elementary knowledge, are not yet qualified for admission to the Final Examination of the Society of Arts, but desire to obtain minor certificates from the District Unions and Local Boards.

3. The beneficial effect of such Examinations in elementary knowledge is greatly enhanced where prizes are offered by the District Unions and Local Boards to be competed for by the Candidates.

SCHEME OF ELEMENTARY EXAMINATIONS FOR 1865.

4. This scheme has been agreed on by the representatives of the District Unions in connexion with the Society of Arts, and presents therefore the advantages of a common standard of uniform Examination Papers, and of common forms of Certificates to be granted by the various District Unions and Local Boards.

5. It is in two grades, and the Candidates should be allowed to select either grade at their discretion.

LOWER GRADE.

1. Every candidate must be examined in the first four rules of Arithmetic, simple and compound.

2. Male candidates must be examined in any *two* at least, and females in any *one* at least, of the three following subjects:—

A. A General knowledge of the Gospel History.

B. The rudiments of English History.

C. The rudiments of the Geography of England.

3. Female candidates must also be examined in plain needlework.

4. Fairly good writing and spelling, with good reading of a simple narrative, will be required.

5. A satisfactory examination will entitle the candidate to a certificate from the District Union or Local Board.

HIGHER GRADE.

1. Every candidate must be examined in Arithmetic, including the Rule of Three, Decimal and Vulgar Fractions.

2. Male candidates must be examined in any *two* at least, and females in any *one* at least, of the three following subjects:—

A. The facts of St. John's Gospel and the Acts of the Apostles.

B. English History from the accession of George I. to the Peace of 1763.

C. Geography of Great Britain and Ireland.

* Except in some special cases where prizes are expressly offered by local bodies to pupil teachers

3. Every female candidate must also show proficiency in needle-work.

4. A fairly good handwriting, spelling, and knowledge of grammar will be required.

5. A satisfactory examination will entitle the candidate to a certificate from the District Union or Local Board.

6. These Examinations must be held in 1865, on 31st February and the 1st, 2nd, and 3rd March, after 4 p.m.

7. The Secretary of each District-Union and Local Board desiring to use the Elementary Examination papers,* and the Forms of Certificate, provided for common use, must apply for them to the Secretary of the Society of Arts, before the 1st of February, stating the number of *male* and *female* Candidates respectively in *each grade*. The Examination papers will be forwarded to the Secretary of the Board, but must of course be kept secret from the candidates until the time of the Examination.†

8. When the Previous Examinations are completed, a return, in the following form, must be made to the Secretary of the Society of Arts, who will then forward the proper number of blank Forms of Certificate to be awarded by the Local Board :—

———————————— { Name of Board or District Union.

	Higher Grade.		Lower Grade.	
	Examined.	Passed.	Examined.	Passed.
Males...............				
Females...........				
Totals				

FINAL EXAMINATION BY THE SOCIETY OF ARTS.

9. No Candidate can be admitted to the Final Examination without a Certificate or Pass from a District Union or Local Board, before which he or she has passed a Previous Examination.

10. Every admitted Candidate must be at least 16 years of age.

(*A*.) Members of, or students of classes in, Institutions in Union with the Society of Arts, are examined ... ... Free.

(*B*.) Members of, or students of classes in, Small Institutions,* not in Union with the Society of Arts, but subscribing one guinea a year for admission to the Examinations alone, are examined ... ... Free.

(*C*.) Members of, or students of classes in, "Small Institutions"* not in Union with the Society of Arts, but connected with it through a District Union or Local Board, are examined on payment of a fee of... ... ... 2s. 6d.

(*D*.) Persons of a higher class of society than those described in paragraph I. (Preliminary Notice), are examined on payment of a fee of 10s. 6d.

N.B. The Council in every case leave it to the Local Board to decide whether a candidate should pay this higher fee.

11. Candidates coming under the head (*D*.), as well as Professional Teachers and Pupil Teachers, though they may receive certificates, cannot compete for prizes.

12. A copy of Form No. 2 will be forwarded, on the 1st March, to the Secretary of each Local Board, and must be filled up and returned to the Secretary of the Society of Arts before the 20th March. The requisite number of forms No. 4 will then be forwarded, and these, when filled up, must be returned not later than the 27th of March. Each of these forms, when returned, will be numbered at the office of the Society of Arts, and a card for each candidate, with his name and his number, will afterwards be forwarded to the Secretary of the Local Board for distribution, together with copies of the time-table.

13. The printed papers of questions in the various subjects will be afterwards forwarded to the Secretary of the Local Board; the whole of the papers appointed for each of the evenings of the Examination being contained in a separate sealed envelope, which is not to be opened till the Candidates are present, at half-past six on that evening.

14. Precise details as to the mode in which the Final Examination is to be conducted are contained in the Letter of Instructions (Form No. 6), and members of the Local Boards should make themselves thoroughly acquainted with them.

15. When the Candidates' papers have been submitted to the judgment of the Society's Examiners, certificates of three grades will be awarded, and the names of the Candidates who obtain prizes and certificates will be afterwards published in the *Journal of the Society of Arts*.

16. A Candidate who has obtained from the Society a certificate of the 1st class in any subject, cannot again be examined in the same subject; but a Candidate who has obtained a certificate of the 2nd or 3rd class may, on the recommendation of the Local Board, be examined in the same subject, in a subsequent year, without again passing the Previous Examination.

17. A Candidate who, having obtained a certificate in any subject, desires to be examined in some other subject, in a subsequent year, may be "passed" by the Local Board, after examination in that subject, without re-examination in the elementary subjects; but, in all cases, the name must be returned in the proper form (No. 4).

18. Particulars of the subjects for the Final Examination are given on the next page.

19. The Time-table has been drawn up to meet the general convenience of the Candidates; and *no variation* of it can *possibly* be allowed, so that, in choosing the subjects in which they desire to be examined, Candidates must take notice of the arrangements of this Time-table, as they *cannot* be examined in *two* subjects which are set down for the same evening. The hours of Examination must be strictly adhered to.

20. The Examiners will reject all ill-written, ill-spelt, ill-composed, or ungrammatical papers that may be laid before them.

* The uniform Examination Papers afford a common standard of examination; and, to promote uniformity in the application of that standard, special copies of the examination papers, with the number of marks to be awarded for a complete answer to each question, will be printed for the use of the examiners alone. Thus, suppose that in a paper there are twelve questions, and that the aggregate number of marks assigned to the paper is 120; the number of marks placed opposite to each of the questions will depend upon their relative difficulty, and the proportion of these marks given by the examiner for the answer of any candidate will depend upon its accuracy and completeness. Supposing a perfect answer to a question to be set down as worth 20 marks, an examiner may award 20, 15, 12, or any less number, according to the merit of the answer. Thus the candidates all over the country, though their papers be tested by different examiners, will be placed as nearly as possible upon on equal footing. No candidate should receive a certificate who does not obtain at least 30 marks in *each* paper, the whole paper being worth 120 marks. In the subjects of reading, writing, spelling, and needlework, it is not thought desirable to fix any number of marks as a standard of proficiency. It is important that the same persons should examine *all* the candidates in any one subject at any centre.

† In any case in which a Local Examining Body may examine candidates in the doctrines of Holy Scripture, in the Prayer Book, or in any other religious formulary, the results of such Examination may be stated, by that local Examining Body, on the certificate; though the form of certificate provided for common use does not include religious doctrine. The "Metropolitan Association for Promoting the Education of Adults" announces that at its request the Bishops of London and Winchester have established collateral examinations in the Bible and Prayer Book, with certificates and prizes for those certificates of that Association who may desire to undergo examinations in such subjects.

* Small Institutions are defined as those which have an income of less than £75 a year.

Time-Table for 1865.

Tuesday, 25th April, From 6·30 to 9·30 p.m.	Wednesday, 26th April, From 6·30 to 9·30 p.m.	Thursday, 27th April, From 6·30 to 9·30 p.m.	Friday, 28th April, From 6·30 to 9·30 p.m.
Arithmetic.	Book-keeping.	Algebra.	Geometry.
Trigonometry.	Navigation and Nautical Astronomy.	Practical Mechanics.	Mensuration.
Electricity and Magnetism.	Conic Sections.	Astronomy.	Principles of Mechanics.
Light and Heat.	Chemistry.	Animal Physiology.	Botany.
Agriculture.	Music.	Political and Social Economy.	Geography.
Mining and Metallurgy.	Domestic Economy.	French.	Latin.
Geometrical Drawing.	English History.	†English Literature.	Logic and Mental Science.
German.	Italian.		Freehand Drawing.
			Spanish.

† Two Papers of one hour and a half each in this subject are considered as one.

LOCAL EDUCATIONAL BOARDS.

21. Local Boards may be formed wherever the managers of Institutions, or other persons, may be prepared to co-operate with the Society of Arts.

22. Each Local Board must consist of at least three members, and must have a Chairman and a Secretary. The district for which the Board is to act should be defined; and every Educational Institution within those limits should be represented in the Board. The composition of the Board must be such as to command the respect and confidence of the neighbourhood. No member or officer of a Local Board can be admitted to the examinations.

23. The duties of the Local Boards may be defined as follows:—

(*A.*) To give publicity to the system of Examinations by the circulation of the programmes, hand-bills, &c. (copies of which will be furnished *gratis* on application), and to give encouragement and advice to those young persons who are likely to become candidates.

(*B.*) To hold the Previous Examinations.

(*C.*) To superintend the Final Examinations.

24. Local Boards make no payment to the Society, unless they exercise the power of admitting candidates who are not members of any Institution in union with the Society of Arts (see par. 10 *C.*); in which case a subscription of one guinea a year must be paid.

25. A detailed list of each Local Board (giving the exact address of the Secretary) must be submitted to the Council of the Society of Arts before the 1st of February, 1865, when the general list of such Boards will be published; and where a Local Board comprises so large a district that, for the convenience of the candidates, Branch Local Boards have to be formed, lists of these must also be given. All changes in the composition of the Boards must be notified to the Society of Arts.

SUBJECTS FOR THE FINAL EXAMINATION IN 1865.

***** Secretaries of Local Boards are particularly requested to report to the Council, before the 15th December, 1864, how many Candidates are preparing for examination in each of these subjects.**

26. In the following paragraphs will be found brief outlines of the subjects in which candidates may be examined, and their attention is especially drawn to this part of the programme. In many instances the Examiner has set down certain Text-books; but, in most cases, a candidate may exercise his own judgment as to what Text-book he uses; real knowledge, however or wherever acquired, will be accepted by the Examiners. In the following subjects, however, Political Economy, English History, English Literature, Logic, Latin and Roman History, French, German, Italian, and Spanish, the course of study is necessarily prescribed with more or less exactness.

I.—Arithmetic.

Examiner.—Rev. Alexander Wilson, M.A., National Society, London.

27. Practice—Simple and Compound Proportion—Interest — Discount — Insurance — Vulgar and Decimal Fractions; with the principles of a Decimal Notation in money on the basis of the pound unit.

28. The questions framed from the preceding syllabus will consist mainly of practical problems, and the Examiner will take into account not only the correctness of the answers, but also the excellence of the methods by which they are worked out, and the clearness and neatness of working, *which must always be shown.*

29. Text Books:—Any of the modern treatises on Arithmetic, such as Hunter's Text Book (*National Society*), Colenso (*Longmans*), or Barnard Smith (*Macmillan*).

II.—Book-keeping by Double Entry.

Examiner.—John Ball, Esq., of the firm of Messrs. Quilter and Ball.

30. Candidates should be prepared to answer questions as to the nature and use of the different books usually kept in a merchant's office; to journalize a series of transactions from a waste book, and having posted the entries to the ledger, to balance the accounts, to prove the correctness of the postings by a trial-balance, and finally to exhibit an account of profit and loss, and a balance sheet.

31. Text Books:—Rudimentary Book-keeping (*Weale's Series*). Kelly's Elements of Book-keeping (*Simpkins and Co*). Examination-Questions in Book-keeping by Double Entry, by the Rev. J. Hunter, M.A. (*Longmans*).

III.—Algebra.

Examiner.—J. J. Sylvester, Esq., M.A., F.R.S., Professor of Mathematics at the Royal Military Academy, Woolwich.

32. Elementary Operations and Fractions. Simple and Quadratic Equations and Problems leading to them. Involution and Evolution. Surds. Arithmetical and Geometrical Series. Combinations and Permutations. Binomial Theorem.

33. Text Books:—Todhunter's Algebra (*Macmillan*), Colenso's Algebra (*Longmans*), Lund's, or any other modern treatise on Algebra.

IV.—Geometry.

Examiner.—Rev. B. Morgan Cowie, M.A., Professor of Geometry at Gresham College; one of H.M. Inspectors of Schools.

34. A facility in solving geometrical theorems and problems, deducible from the first six books of Euclid, will be expected on the part of those who desire to obtain certificates of the first or second class.

35. Text Books:—Euclid, Books I., II., III., IV., VI., XI., as far as Prop. 21; Pott's smaller edition (*Parker*). Green's Euclid's Plane Geometry, practically applied, is a useful help to those who are studying by themselves (*Heywood*, Manchester; *Simpkin, Marshall and Co.*, London).

36. The Examiner in his remarks on last year's papers speaks of "cases where propositions are fairly proved but the constructions omitted," and urges "the absolute necessity of clearly indicating the construction."

V.—Mensuration.

Examiner.—John Sykes, Esq., M.A., Fellow of Pembroke College, Cambridge, Assistant-Secretary to the Committee of Privy Council on Education.

37. The calculation of the areas and circumferences of plane figures bounded by arcs of circles or right lines, and solid contents of cones, cylinders, spheres, &c. Candidates will be expected to be familiar with the different rules for measuring and estimating artificers' work, such as joiners', bricklayers', masons', and plumbers' work, and to be able to prepare estimates of such work from given quantities.

38. Text Books:—Lund's Mensuration, Part III., of his Elements of Geometry and Mensuration. Tate's Mensuration. Young's Treatise on Mensuration (*Simms and M'Intyre.*

39. The Examiner, in his remarks on last year's papers, says he would "like to see a more general knowledge of the Elements of Geometry made the foundation of Mensuration; in many instances the candidates have nothing to rely upon but an exact recollection of their rules." He also urges the importance of an acquaintance with the metrical system.

VI.—Trigonometry.

Examiner—Rev. T. G. Hall, Professor of Mathematics in King's College, London.

40. In Plane Trigonometry, the formulæ for the trigonometrical functions of angles, the numerical solution of plane triangles, the use of logarithmic tables, and angular and exponential series.

41. Spherical Trigonometry, Napier's Rules, Solution of Spherical Triangles.

42. Text Books:—Snowball's or Todhunter's Trigonometry, Hall's Trigonometry for Schools (*Christian Knowledge Society*), or any other of the modern treatises on Trigonometry. Mathematical Tables (*Chambers' Series*).

VII.—Conic Sections.

Examiner.—Rev. Bartholomew Price, M.A., F.R.S., Sedleian Professor of Natural Philosophy in the University of Oxford.

43. The properties of the three curves treated geometrically; also as deduced from the cone. The principles of projection, orthogonal and central, applied to derive the properties of the conic sections from those of the circle.

44. Analytical Conics, including the equations of the straight line, the circle, the three conic sections, and the general equation of the second degree.

45. Text Books:—Drew's Conic Sections (*Macmillan*). Taylor's Conic Sections (*Macmillan*). Salmon's Conic Sections (*Longmans*). Todhunter's Conic Sections (*Macmillan*).

VIII.—Navigation and Nautical Astronomy.

Examiner.—Rev. Joseph Woolley, LL.D., one of Her Majesty's Inspectors of Schools.

46. A good knowledge of Plane and Spherical Trigonometry, of the definitions and terms used in Nautical Astronomy, and of the various measurements of time and their mutual conversions will be required, as well as skill in the use of logarithmic tables, and neatness, order, and accuracy in the numerical solutions of problems. The candidate should understand the construction of charts; the nature and laws of circular storms; great circle sailing, &c.; the methods of determining the latitude, longitude, variation of the compass, and error and rate of a chronometer by astronomical observations, with the demonstrations of the formulæ employed; the use of Nautical Astronomical Instruments, &c.

47. Text Books:—The Nautical Almanac (*Murray*). Riddle's Navigation and Nautical Astronomy (*Law*, Essex-street).

48. Candidates in this subject should be allowed the use of the Nautical Almanac and Tables *during the Examination.*

IX.—Astronomy.

Examiner.—Jas. Glaisher, Esq., F.R.S., Royal Observatory, Greenwich.

49. The principles of Plane Astronomy.

50. Text Books:—Herschel's Astronomy (*Longmans*); first chapters. Airy's Lectures on Astronomy. Maddy's Elements of Astronomy. Practical Astronomy (Orr's Circle of the Sciences).

51. The Examiner advises that attention be paid to interpolations, at least including second difference, and recommends the careful study of geometry, particularly solid geometry, as well as plane and spherical trigonometry.

X.—Principles of Mechanics.

Examiner.—Rev. Jonathan Bates, M.A., Fellow of Gonville and Caius College, Cambridge.

52. The properties of matter, solid, fluid, and gaseous.

53. Statics: The composition, resolution, and equilibrium of pressures acting on a material particle; and on constrained particles; machines; attractions.

54. Dynamics: the laws of motion; impact; projectiles; constrained motion; central forces; oscillation.

55. Rigid Dynamics: Motion of a rigid body about a point;—of a free rigid body;—of a system of rigid bodies.

56. Hydrostatics: Pressures of fluids; equilibrium of floating bodies; specific gravity; elastic fluids; machines; temperature and heat; steam; evaporation.

57. Hydrodynamics: Motion and resistance of fluids in tubes, &c.; waves and tides.

58. Pneumatics: Mechanical properties of air; the barometer, and other machines illustrating the mechanical properties of air,

59. Text Books:—Todhunter's Statics, or Parkinson's Mechanics. Goodwin's Mathematics. Miller's, Phear's, or Besant's Hydrostatics. Webster's Theory of Fluids. The treatise on this subject in Orr's Circle of the Sciences. Golding Bird's Elements of Natural Philosophy, by C. Brooke (*Churchill*). Lardner's Handbooks on Natural Philosophy.

XI.—Practical Mechanics.

Examiner.—T. M. Goodeve, Esq., Professor of Mechanics at the Royal Military Academy, Woolwich.

60. The applications of the Principles of Mechanism to Simple Machines. The Steam Engine.

61. Text Books:—Bourne's Catechism of the Steam Engine (*Longmans*). Scott Russell on the Steam Engine. Nasmyth's Elements of Mechanism, with remarks on Tools and Machinery (*Weale*). Goodeve's Elements of Mechanism (*Longmans*).

XII.—Electricity and Magnetism.

Examiner.—Charles Brooke, Esq., M.A., F.R.S., Surgeon to the Westminster Hospital.

62. Construction and Properties of Magnets; Magnetic Instruments; Terrestrial Magnetism; Diamagnetism.

63. Statical or Franklinic Electricity; Voltaic Electricity; Electro-dynamics; Electro-telegraphy; Electro-metallurgy; Thermo-Electricity; Organic Electricity.

64. Text Books:—Golding Bird's Elements of Natural Philosophy, by C. Brooke (*Churchill.*) Lardner's Handbooks of Natural Philosophy (*Walton and Maberly*). Fleeming Jenkin's report on the Electrical Instruments in Class XIII. of the Exhibition of 1862, for Electro-telegraphy. Herschel's Discourse on the Study of Natural Philosophy (*Longmans*) for a *general* view of the subjects.

XIII.—Light and Heat.

Examiner.—Richard Potter, Esq., A.M., Professor of Natural Philosophy and Astronomy in University College, London.

65. What is the sense of sight?—ancient theories—modern definitions and hypotheses of the nature of light—the especial privileges of animals which possess organs of vision—the simple laws or properties of light required to be known before we can discuss the structure of the eye, and the construction of telescopes, microscopes, and other optical instruments—optical images real and virtual—how do they occur in optical instruments.

66. Why do we distinguish between Physical and Geometrical optics?—what are double refraction of light—polarization of light—interference of light—examples of these properties, how shown—phenomena of recurring colours—examples—how are explained the colours of the soap bubble—the colours seen on looking towards a light through the feathers of small birds—the colours of mother of pearl—the rainbow, &c., &c.—the laws of the inter-

ference of polarized light—to describe cases of these splendid phenomena.

67. What are the definitions of heat, radiant, latent, and sensible?—what is meant by caloric?—hypotheses of the nature of heat—capacity of bodies for heat—the temperature of bodies—how measured by instruments—descriptions of thermometers and pyrometers—the scales of thermometers—how compared—how the volumes of solids, liquids, and gases, depend on their temperature—absolute zero of cold—elastic force of vapours and gases produced by heat employed in steam and air engines—winds from the unequal heat of the atmosphere, What are the connexions and analogies of heat and light?

68. Text Books:—The Library of Useful Knowledge. Brewster's Optics (Cabinet Cyclopædia). Potter's Physical Optics, the descriptive and experimental treatise (or part first) (*Walton and Maberly*).

XIV.—Chemistry.

Examiner.—**A. W. Williamson, Esq., F.R.S., Professor of Chemistry, University College, London, President of the Chemical Society.**

69. Preparation and properties of the chief gases, acids, bases, and salts. Laws of combining proportion by weight and by volume. Analytical processes for the detection and separation of metals, acids, &c. Preparation and distinctive properties of the chief kinds of alcohol, of organic bases, fixed and volatile organic acids, sugars, woody-fibre, starch, &c.

70. Candidates are expected to be able to explain decompositions by the use of symbols. Questions illustrative of general principles will be selected from the following, amongst other manufactures: Metallurgy of Lead, Iron, and Copper; Bleaching, Dyeing, Soap-boiling, Tanning; the manufacture of Coal-Gas, Sulphuric Acid, Soda-Ash, &c.

71. Text Books:—Fownes' Manual of Elementary Chemistry. Miller's Elements of Chemistry.

XV.—Mining and Metallurgy.

Examiner.—**J. Arthur Phillips, Esq., Civil Engineer, Graduate of the Imperial School of Mines of France, &c.**

72. Candidates should be able to identify with facility the ores of the more common metals, and be acquainted with their chemical composition. They should also be familiar with the forms of occurrence of the various metallic ores, and the usual methods employed for their extraction and subsequent purification by crushing, stamping, and washing, &c. Underground surveying, the principles of ventilation, particularly as applicable to collieries; a knowledge of furnace assaying, and a general acquaintance with the metallurgy of the more important metals are also required.

73. First-class certificates can be given to those only who have either acquired some practical knowledge of mining, or who possess a special acquaintance with the metallurgy of at least one of the useful metals.

74. Text Books:—Dana's Mineralogy (*Trubner and Co.*, Paternoster-row). Mitchell's Assaying (*Baillière*). Manual of Metallurgy (*Griffin*). Useful Metals and their Alloys (*Houlston and Wright*). Ure's Dictionary of Arts, Manufactures, and Mines (*Longmans*). Percy's Metallurgy (*Longmans*). Metallurgy of Iron, Truran (*Spon*).

XVI.—Botany.

Examiner.—**Daniel Oliver, Esq., F.R.S., F.L.S., Professor of Botany in University College, London, and Librarian of the Herbarium at the Royal Gardens, Kew.**

75. Sect. I.—The Structure of Plants and Vegetable Physiology. The Functions of the Various Organs, and their Morphological Relations. The Nature of the Principal Tissues. The Meaning of Botanical Terms. The application of Structural and Physiological Facts to Practical Purposes.

76. Sect. II.—Systematic Botany. The general principles upon which the Classification of Plants is based. The distinctive characters of the principal British Natural Orders of Plants. Naming Common Wild Flowers at Sight. The sources of the most important Economic Vegetable Products:—Timbers, Fibres, Fruits, Drugs, &c.

77. Section III.—Descriptive Botany. The Art of Describing Plants Correctly in Scientific Language.*

78. Text Books:—Lindley's School Botany (*Bradbury and Evans*); Oliver's Lessons in Elementary Botany (*Macmillan*); Lindley's Theory and Practice of Horticulture (*Longmans*); Oliver's Guide to the Kew Museums (pamphlet) (*W. H. Smith and Son*).

79. Candidates will be expected to return three correct answers to questions in Section I., three in Section II., and at least two of the plants must be described and referred to their respective natural orders in Sect. III.

80. Students are very strongly recommended to the frequent practice of describing plants; at first on forms or "schedules," as given in Professor Oliver's "Lessons," page 59, and, when sufficiently advanced, at length, as in the examples given at page 293 of the same work, and in Dr. Lindley's "School Botany."

XVII.—Agriculture.

Examiner.—**J. C. Morton, Esq.**

81. A few questions will be put on each of the three principal departments of Agriculture, viz.:—(1) The tillage, drainage, and manuring of the soil; (2) The cultivation of plants; (3) Live-stock management and the meat-manufacture. A certificate of proficiency will be easily obtained by any one able to direct the labour of the farm, who has been accustomed to consult any of the standard works on English Agriculture.

XVIII.—Animal Physiology in Relation to Health.

Examiner.—**John Marshall, Esq., F.R.S., F.R.C.S., Surgeon to the University College Hospital, and Lecturer on Anatomy in the Government Department of Science and Art.**

82. The general principles of Animal Physiology, and the application of them to the preservation of health and to the wants and emergencies of daily life.

83. Text Books:—Carpenter's Animal Physiology, 1859 (*Bohn*). Lardner's Animal Physics (*Walton and Maberly*). Translation of Milne Edwards' Manual of Zoology (*Renshaw*). Marshall's Descriptions of the Human Body, with Atlas (*Day and Son*), for details of Anatomy.

XIX.—Domestic Economy.

Examiner.—**The Very Rev. Richard Dawes, F.R.S., Dean of Hereford.**

Questions for Male and Female Candidates.

84. Domestic Economy being mainly based on the applications of Chemistry and Physiology, both male and female candidates will be required to show an acquaintance with the rudiments of these sciences. It should embrace the phenomena of nutrition, respiration, the functions of the skin, &c.; the rationale of lighting, warming, ventilating, cleaning, disinfecting, &c.; of cooking, preserving, &c.; and the origin and manufacture of household articles, as far as this may be necessary for a correct appreciation of their relative value for use, and for the detection of defective quality, adulteration, or fraud.

85. The essentials of a healthy and comfortable dwelling—clothing in relation to sanitary principles—food, animal and vegetable. Dietaries. Effects of stimulants and narcotics. Fuel, and other household stores. Weights and measures. Keeping of household accounts.

Questions for Male Candidates only.

86. Materials and appliances involved in the construction of dwellings. Co-operative Building and Investment Societies. Mutual Provident Societies for various purposes. Savings' Banks. Present and deferred annuities.

*** Living specimens are provided for the Examination by the Society of Arts.**

Questions for Female Candidates only.

87. The management of infants. The care of the sick, &c.

88. Text Books:—For Introductory Scientific Knowledge:—Laws of Matter and Motion (Chambers' Educational Course) (*Chambers*). Mechanics of Familiar Things, by Thomas Tate (*Longmans*). Experimental Chemistry, by Thomas Tate (*Longmans*). Physiology for Schools, by Mrs. C. Bray (*Longmans*). For Domestic Economy in general:—A Manual of Domestic Economy, by Tegetmeier (*Home and Colonial School Society*). Household Economy, by Margaret Brewster (*Constable and Co.*). Domestic Economy (Gleig's School Series) (*Longmans*).

XX.—Political and Social Economy.

Examiner.—Charles Neate, Esq., M.A., M.P., late Professor of Political Economy in the University of Oxford.

89. Text Books:—Adam Smith (M'Culloch's edition). Principles of Political Economy, by John Stuart Mill.

90. Some knowledge of the Commercial, Financial, and statistical history of the United Kingdom will be required, for which "Porter's Progress of the Nation," "M'Culloch's Commercial Dictionary," and "Merivale's Lectures on Colonisation and the Colonies" (new edition), may be consulted.

91. N.B.—The Principles of Political Economy, by John Stuart Mill, need be studied by those alone who aspire to a first-class certificate.

XXI.—Geography.

Examiner.—Wm. Hughes, Esq., F.R.G.S., Professor of Geography in Queen's College, London.

92. Candidates must show a sound knowledge of Elementary Geography, physical and descriptive. Such knowledge must embrace an acquaintance with at least the outlines of the great natural features of the globe, the political divisions of countries, and the localities of towns and other places of importance. This knowledge will be looked for in fuller extent with regard to the British Islands, and the various portions of the British Empire, than with regard to other countries. The growing importance of the colonial dependencies of Britain renders a knowledge of their geography now more than ever necessary. The North American and Australian colonies of Britain are hence proposed as a subject for more especial study on the part of the intending candidates for the ensuing year's examinations, and their attention is directed to them accordingly. In evidence of the knowledge possessed regarding those regions, the candidate will be required to sketch, from memory, a map of any one of the North American or Australian colonies that may be named by the examiner. Such sketches need not possess accuracy of detail, but should at least show the general direction of coast-lines, mountain-chains, or river-courses, with the localities and names of the principal towns.

93. Candidates who aim at the highest class of certificate should be also prepared to answer such questions upon Geography in its relation to the Physical Sciences and the History of Mankind, as involve a general acquaintance with the subject of Climate, the laws of Meteorology, the Distribution of Plants and Animals over the Globe, the leading outlines of Geology, the Ethnographic Division of the Human race, and the commercial resources of different lands. This kind of knowledge is looked for, not in place of geographical knowledge of a more elementary kind, but as supplementary to it, and throughout based upon it.

94. Text Books:—Manual of Geography, by William Hughes (*Longmans*). Guyot's Earth and Man (*Parker and Son*). Physical Geography, by Sir John F. W. Herschel (*A. and C. Black*). Page's Introductory Text Book of Geology (*Blackwood*). The School Physical Atlas (*either Johnstone's, Philips's, or that published by the National Society*).

XXII.—English History.

Examiner.—C. H. Pearson, Esq., M.A., Professor of Modern History, King's College, London.

95. English History and English Constitutional History. Text Books:—The Student's Hume. Creasy's Rise and Progress of the English Constitution.

96. Special subject:—The Reigns of John and Henry III. Text Books:—Lingard; and Blaauw's Barons' War.

97. The Examiner advises that candidates should learn to connect and compare various periods with one another, and to follow the history of institutions more continuously through successive stages of growth. They are also warned against that habit of declamation and eloquent reflection which occupies time and space that might be employed to better advantage in a more careful recollection of facts. The first class would be considerably enlarged if the candidates would accustom themselves to answer questions on paper from time to time in the course of their reading, and to submit such answers for criticism and correction to those who superintend their studies.

XXIII.—English Literature.

Examiner.—Rev. Samuel Clark, M.A., F.R.G.S., *Chairman of the Board of Examiners.*

98. Any two, but not more than two, of the authors in the following list may be taken up for examination:—

Shakspeare.—Macbeth; Henry V.; The Tempest.
Milton.—Paradise Lost, Books I. to VI.
Butler.—The Analogy.
Reed.—Lectures on the History of English Literature.

99. Candidates are recommended to make a very careful study of the text of the authors they may select. The questions on each author will be divided into two sections, the first intended to test the candidate's acquaintance with the text, the second his knowledge of the subject-matter and his critical and literary information. Full marks will not be given for answers in the second section, if those in the first section do not prove satisfactory.

100. The Examiner, though he speaks generally favourably of last year's papers, says that some of the candidates "have indulged in needless circumlocution, in some cases repeating the phraseology of the questions; and several of the best qualified candidates have shown a want of due acquaintance with the technicalities of grammar."

XXIV.—Logic and Mental Science.

Examiner.—(Will be appointed.)

101. Logic: Candidates will be expected to answer questions on the different processes of thought, and on the connection of thought and language. Every Candidate must attempt to analyse examples of reasoning, and to detect fallacies.

102. Text Books:—Whateley's Elements of Logic, or Thomson's Outline of the Laws of Thought.

103. A Candidate for a second or third-class Certificate will be expected to prepare, in addition, any one of the following books which he may select:—Mill's System of Logic, Book III., of Induction; Bishop Butler's Sermons; Paley's Moral Philosophy; Dugald Stewart's Philosophy of the Human Mind, Volume I.

104. A Candidate for a first-class Certificate will be expected to prepare any two of these works which he may select.

XXV.—Latin and Roman History.

Examiner.—Rev. F. Temple, D.D., Head Master of Rugby School.

105. Cicero de Senectute and de Amicitiâ. Virgil. Æneid, Book xii.

106. Roman History to the death of Augustus Cæsar. Text Book:—Liddell's History of Rome, in one volume.

XXVI.—French.

Examiner.—Alphonse Mariette, Esq., M.A., Professor of French, King's College, London.

107. The Examination paper will be divided into three parts.

108. The first will comprise grammatical questions and an extract from a modern French writer, to be translated into English. Candidates merely aiming at a 3rd class certificate should confine themselves to this first part.

109. The second part will comprise, together with a few grammatical questions, an English extract to be translated into French, and a list of idiomatic expressions to be rendered from French into English, or *vice versâ*. This should be done satisfactorily by the candidate who aims at a 2nd class certificate.

110. In the third part, candidates for a 1st class certificate will have to translate an English extract into French (to which great importance is attached), and to answer properly (*in French*) some *elementary* questions on the two following subjects:—

1. French literature in the first half of the 18th century, comprising the great writers that were born between the years 1651 and 1700 from (Fénelon to Voltaire).

2. The History of France, from the Treaty of Ryswick to that of Aix-la-Chapelle (1697 to 1748).

111. Books recommended:—Mariette: Half-Hours of French Translation (*Williams and Norgate*, London and Edinburgh). Nisard: Histoire de la Littérature Française, vols. 3, 4 (*Williams and Norgate*). Masson: Introduction to the History of French Literature (*Black*, Edinburgh). Duruy: Histoire de France, vol. 2 (*Williams and Norgate*).

112. The Examiner, in speaking of last year's papers, says:—"The translations from English into French were throughout very incorrect, and, like the grammatical answers in the 3rd class papers, betrayed a general absence of progressive and systematic study."

XXVII.—German.

Examiner.—Dr. Wintzer, Teacher of German in King's College, London.

113. Schiller's Geschichte des dreiszigjährigen Krieges. Schiller's Jungfrau von Orleans. Göthe's Egmont. Kohlrausch's Deutsche Geschichte.

114. Extracts from each of the above works will be set for translation. Each candidate must translate at least one of them. First-class certificates will be given to those only who translate *well* from English into German and write in German a well-expressed essay, on a subject which will be announced to them when they come up for examination.

XXVIII.—Italian.

Valerio Pistrucci, Esq., Professor of Italian in King's College, London.

115. Candidates for first-class certificates will be required to translate into English some extracts from the following works:—Dante, L'Inferno; Petrarca, Trionfo della Morte; Ariosto, Orlando Furioso, cantos 1 and 2; Tasso, La Gerusalemme, cantos 8 and 9. They must also translate into Italian an extract from some English author; answer some grammatical questions; and give the proper or approximate English equivalents for a certain number of Italian idioms.

116. Candidates for second and third-class certificates will be required to translate into English selections from the following modern prose writers—Foscolo, Botta, Manzoni; and to answer some grammatical questions.

XXIX.—Spanish.

Examiner.—B. B. Aguirre, Esq., Lecturer on Spanish in King's College, London.

117. Candidates for a first-class certificate will have to translate an English passage into Spanish, to render into English or French several idiomatic phrases, and to write in Spanish a short essay.

118. Candidates for a second-class certificate will have to translate from English into Spanish, and to answer several questions upon the Spanish verbs.

119. Candidates for a third-class certificate will have to translate from Spanish into English, and to answer several grammatical questions.

120. Books recommended:—Conquista de Mejico, por Dn. Jose Morales Santistevan; Trozos escojidos delos mejores hablistas espanòles, por Dn. Carlos Ochoa; Estudios filolójios, por Dn. Manuel Martinez de Morentin.—Hallam, Literature of Europe.

XXX.—Freehand Drawing.

Examiner.—F. S. Cary, Esq.

121. In freehand drawing the Candidate will be required to show a practical knowledge of the principles usually applied in the imitation of natural and artificial forms, such as furniture, manufactured articles, ornament, foliage, and the human form.

XXXI.—Geometrical Drawing.

Examiner.—Thomas Bradley, Esq., Professor of Geometrical Drawing in King's College, London.

122. Practical Geometry, or Geometrical Drawing, required by the Mechanist, Engineer, Builder, and all in any way employed in the art of construction. The Candidate will be examined in Practical Plane Geometry, the construction of right line figures of given areas, and of curve lines required in the arts, &c.; in Practical Solid Geometry, Elementary Problems on the line and plane, and their combinations, the representation by orthographic projection of simple solids from conditions, and in the principles of Development as used in the construction of Maps, &c.; and in Elementary Perspective Projection as far as it is required by the Architect.

123. Text Books:—Geometry, Plane, Solid, and Spherical (*Library of Useful Knowledge*) is especially recommended as a work to be studied on Theoretical Geometry.—Elements of Geometrical Drawing, published by the Committee of Council on Education, 2 parts (*Chapman and Hall*).—Hall's Elements of Descriptive Geometry for Students in Engineering. Heather's Descriptive Geometry. Also the following French Works:—Elémens de Géométrie Descriptive, par S. F. Lacroix; Traité de Géométrie Descriptive, par Lefebure de Fourcy; Nouveau Cours raisonné de Dessin Industriel, par Armengaud, aîné, et Armengaud, jeune, et Amouroux; Bardin's Works on Descriptive Geometry.

124. The Examiner, in his remarks on last year's papers, says "There is still a general failure in the Solid Geometry, owing to a want of knowledge, both theoretical and practical, of that of the line and plane in space; this deficiency compels the candidate to employ awkward and circuitous constructions which admit of far easier and more accurate methods. The candidates frequently disregard the conditions, and give in constructions having no reference to the question before them."

XXXII.—Theory of Music.

Examiner.—John Hullah, Esq.

125. Notation, the modern modes, intervals, time, signatures, the stave, transposition, modulation, terms, and characters in common use.

126. The Elements of Harmony.

127. Musical History and Biography.

128. Arrangements must be made, in the Previous Examinations by the Local Boards, to test Candidates, by oral examination, in their knowledge or appreciation of the *sound* of musical successions and combinations. A form of the test to be used for this purpose by the Local Board at the Previous Examination will be sent by the Council to such Local Boards as may *apply for it*, in due time before the Examination.

EXAMINATION PRIZES FOR 1865.

THE PRINCE CONSORT'S PRIZE.

130. His Royal Highness the late President of the Society was pleased to offer annually to the candidate who, obtaining a certificate of the first-class in the current year, shall have obtained in that year and the three years immediately preceding it, the greatest number of such certificates, a Prize of Twenty-five Guineas, and this Prize Her Majesty the Queen has graciously intimated her intention to continue. This Prize cannot be taken more than once by the same candidate. It will be accompanied by a certificate from the Society of Arts, setting forth the special character of the Prize, and the various certificates for which it was granted.

GENERAL PRIZES.

*** No Prize in any subject will be awarded to a Candidate who does not obtain a Certificate of the first-class therein.

1. Arithmetic	First Prize, £5. Second Prize, £3.
2. Book-keeping	First Prize, £5. Second Prize, £3.
3. Algebra	First Prize, £5. Second Prize, £3.
4. Geometry	First Prize, £5. Second Prize, £3.
5. Mensuration	First Prize, £5. Second Prize, £3.
6. Trigonometry	First Prize, £5. Second Prize, £3.
7. Conic Sections	First Prize, £5. Second Prize, £3.
8. Navigation and Nautical Astronomy	First Prize, £5. Second Prize, £3.
9. Astronomy	First Prize, £5. Second Prize, £3.
10. Principles of Mechanics	First Prize, £5. Second Prize, £3.
11. Practical Mechanics	First Prize, £5. Second Prize, £3.
12. Electricity and Magnetism	First Prize, £5. Second Prize, £3.
13. Light and Heat	First Prize, £5. Second Prize, £3.
14. Chemistry	First Prize, £5. Second Prize, £3.
15. Mining and Metallurgy	First Prize, £5. Second Prize, £3. Additional by Gift of Sir Thomas Phillips, F.G.S. :— Third Prize, £2; and Three Prizes of Books, value £1 each.
16. Botany	First Prize, £5. Second Prize, £3.
17. Agriculture	First Prize, £5. Second Prize, £3. Additional by Gift of J. C. Morton, Esq. :— Third Prize, £2; and Three Prizes o Books, value £1 each
18. Animal Physiology (in relation to Health)	First Prize, £5. Second Prize, £3. Additional by Gift of Harry Chester, Esq. :— Third Prize, £2; and Three Prizes of Books, value £1 each.
19. Domestic Economy	First Prize, £5. Second Prize, £3.
20. Political and Social Economy	First Prize, £5. Second Prize, £3.
21. Geography	First Prize, £5. Second Prize, £3.
22. English History	First Prize, £5. Second Prize, £3. Additional by Gift of Sir C. Wentworth Dilke, Bart. :— Third Prize, £2; and Three Prizes of Books, value £1 each.
23. English Literature	First Prize, £5. Second Prize, £3. Additional by Gift of Sir C. Wentworth Dilke, Bart. :— Third Prize, £2; and Three Prizes of Books, value £1 each.
24. Logic and Mental Science	First Prize, £5. Second Prize, £3.
25. Latin and Roman History	First Prize, £5. Second Prize, £3.
26. French	First Prize, £5. Second Prize, £3.
27. German	First Prize, £5. Second Prize, £3.
28. Italian	First Prize, £5. Second Prize, £3.
29. Spanish	First Prize, £5. Second Prize, £3.
30. Freehand Drawing	First Prize, £5. Second Prize, £3.
31. Geometrical Drawing	First Prize, £5. Second Prize, £3.
32. Theory of Music	First Prize, £5. Second Prize, £3.

LOCAL EDUCATIONAL BOARDS.

The following is a List of the places at which Local Boards have already been formed, with the names of the Secretaries, from whom intending Candidates and others may obtain information relative to the Examinations:—

LOCAL BOARDS.	SECRETARIES.
Aberdeen	Mr. James Sinclair, Mechanics' Institution, Aberdeen.
Accrington	Mr. H. G. Duffield, Accrington.
Airdrie	Mr. B. M. McCrae, Airdrie.
Aldershot and Farnham District	Mr. Barrow Rule, M.C.P., Principal of the Classical and Mathematical School, Aldershot.
Ashford	Mr. F. Garaway, Schoolmaster, Ashford New Town.
Ashton and Dukinfield	Mr. James Gould, Mechanics' Inst., Ashton-under-Lyne.
Bacup	Mr. Thos. Newbigging, Bacup.
Banbridge (Ireland) Literary and Mutual Improvement Society	Mr. Alexander Black, Banbridge, County Down, Ireland.
Banbury	Mr. John H. Beale, Banbury.
Barnet	Mr. John Thimbleby, Barnet.
Belfast	Rev. Wm. C. McCullagh, Ballysillan, Belfast.
Birmingham and Midland Institute	Mr. Thos. Martineau, Solicitor, Cannon-st., Birmingham.
Bishop's Stortford	Mr. F. Woodham Nash, B.A., Sion House, Birchanger, Bishop's Stortford.
Blackburn	Mr. W. Gourlay & Mr. J. H. Margerison, Blackburn.
Blandford	Mr. J. B. Green, Architect, &c., Salisbury-street, Blandford.
Bolton	Mr. W. H. J. Traice, Mosesgate, Bolton.
Bradford	Mr. R. Whitaker, Mechanics' Institution, Bradford.
Brighton (for Sussex)	Mr. Barclay Phillips, 75, Lansdowne-place, Brighton.
Bristol	Mr. F. W. Cross, Athenæum, Bristol.
Brompton (near Chatham)	Mr. J. Greenleaf, 8, Prospect-row, Brompton, Chatham.
Bucks and Berks Adult Education Society, Windsor	Rev. Thomas Rooke, M.A., St. Alban-street, Windsor.
Bury (Lancashire)	Mr. Edmund Bunting, Athenæum, Bury.
Bury St. Edmund's	Mr. John Jackson, Head Master of the Commercial School, Bury St. Edmund's.
Canterbury	Mr. W. D. Furley, Canterbury.
Carlisle Mechanics' Institute	Miss Jane Williamson, Mechanics' Institute, Carlisle.
Chatham, Rochester, Strood, and Brompton	Mr. F. Butler, 112, High-street, Chatham.
Chelmsford	Mr. W. Cutts and Mr. Jesse Garrood, Chelmsford.
Crewe	Mr. George Lord, High Town, Crewe.
Croydon	Mr. Francis Warren, Bookseller, 131, High-street.
Darlington	Mr. F. T. Steavenson, Darlington.
Deptford	Mr. T. Earland, 2, Wellington-grove, Greenwich-road.
Derby	Mr. H. M. Holmes, Hon. Local Sec. to the Society of Arts, London-road, Derby.
Devonport	Mr. Wm. Mogg and Mr. Samuel Chapple, Mechanics' Institute, Devonport.
Edinburgh	Mr. H. Bowie, Philosophical Institution.
Faversham	Mr. Frederick W. Monk, Managing Director of the Faversham Institute.
Gilford (Ireland) Young Men's Mutual Improvement Society	Dr. Henry McBride, M.D., Gilford, Co. Down, Ireland.
Glasgow Athenæum	Mr. Moses Provan, Accountant, 110, West George-street, Glasgow.
Glasgow Institution	Mr. John Craig, F.E.I.S., Glasgow Institution, 37, Cathedral-street, Glasgow.
Glasgow Mechanics' Institution	Mr. Robert McIntyre, Director, &c., 96, North Hanover-street, Glasgow.
Glasgow Popular Evening Classes, Andersonian University	Mr. Geo. Martin, 11, Gt. Western-road, Glasgow.
Gosport and Alverstoke Literary and Scientific Institution	Mr. William Short, 56, High street, Gosport.
Greenwich	Mr. Jas. Spencer, 3, Wintown-place, Greenwich, S.E.
Halifax Mechanics' Institution	Mr. A. C. Foster, Solicitor, 1, Westgate, Halifax.
Halifax Working Men's College	Mr. Geo. Gibb, Haley Hill, Halifax.
Hartlepool (West)	Mr. Thos. Preston Brunton, and Mr. John Thomas Belk, Solicitors, West Hartlepool.
Hertford	Mr. J. L. Foster, Hertford.
Hitchin	Mr. Joseph Pollard, High-down, near Hitchin.
Holmfirth	Mr. J. Batley, Holmfirth.
Hull	Mr. P. Blackmore, Young People's Institute, Hull.
Hyde	Mr. William Gee, Mechanics' Institute, Hyde.
Ingrow-cum-Hainworth	Mr. Jackson, Ingrow-cum-Hainworth.
Ipswich	Mr. Edwin Barrett, 31, Corn-hill, & Mr. Herbert Wright, 44, Handford-road, Ipswich.
East Lancashire Union of Mechanics' Institutions, Burnley	Mr. John Sutherland, Post-office, Burnley
,, Haslingden	Mr. J. Binns, Haslingden.
,, Rawtenstall	Mr. T. Thomas, Rawtenstall.
Leeds West Riding Union	Mr. Barnett Blake, Agent of the Yorkshire Union of Mechanics' Institutions.
Leeds Young Men's Christian Association	Messrs. M. Cranswick and H. Clapham, 9, East-parade, Leeds.
Leicester	Rev. H. D. Vaughan, St. Martin's Vicarage, Leicester.
Lichfield	Rev. R. M. Grier, B.A., Lichfield.
Liverpool	Rev. A. Hume, D.C.L., LL.D., 24, Clarence-st., Everton.
Lockwood	Mr. Alfred Lee, Mechanics' Institution, Lockwood.
London, City of London College, Sussex Hall, London, E.C.	Mr. W. H. Hansen, City of London College, Sussex Hall, Leadenhall-street, E.C.
,, Royal Polytechnic Institution (Limited)	Mr. James Cousens, Royal Polytechnic Institution.
London Metropolitan Association:—	
,, Bayswater	Mr. C. Baker, 15, St. Petersburg-place, Bayswater, W.
,, Clapham	Mr. E. Heller, Clapham.
,, Hackney	Mr. H. Gray, Working Men's Inst., Triangle, Hackney.

Lond. Met. Assoc. :—	
,, Lambeth	Mr. T. Heller, Hercules'-buildings, Lambeth, S.
,, Mechanics' Institution	Mr. T. A. Reed, 41, Chancery-lane, W.C.
,, Notting-hill ...	Mr. T. Timson, James-street, Notting-hill, W.
,, Paddington ...	Mr. B. Shaw, Cambridge-square, W.
,, Pimlico	Mr. C. Thompson, Pimlico Literary Institution, Winchester-street, Pimlico, S.W.
,, St. James's, Westminster	Mr. Joseph Randall, 45, Marshall-street, Golden-sq., W.
,, St. Stephen's, Westminster	Mr. J. Cawood, St. Stephen's School, Westminster.
,, St. Thomas, Charterhouse, Evening Classes	Mr. G. Phillipson, St. Thomas' Charterhouse School.
,, Spitalfields and Bethnal-green	Mr. T. N. Day, Abbey-street School, Bethnal-green, N.E.
,, Stepney Deanery	Mr. W. F. Ives, St. John's School, Limehouse.
Louth	Mr. Benjamin Crow, Mechanics' Institution, Louth.
Lynn (King's)	Mr. T. Burton, 16, Buckingham-terrace, Lynn.
Macclesfield	Mr. J. O. Nicholson, Macclesfield.
Manchester	Mr. A. Jarrett, Manchester Mechanics' Institution.
Middlesbro'	Mr. William Taylor, Mechanics' Institute, Middlesbro'.
Mossley	Mr. Aaron Tetlow, Mossley.
Newbury	Mr. T. Gurney, Newbury.
Newcastle-on-Tyne Church of England Institute	Mr. Joseph Forster, St. John's School, Newcastle-on-Tyne.
Newcastle-on-Tyne, Mechanics' Institution.	Mr. Adam Carse, 18, Mosley-street, Newcastle.
Nottingham	Dr. W. Tyndal Robertson, Nottingham.
Oldham	Rev. John Hodgson, Queen-street, Oldham.
Oldham Science School...	Rev. D. M. Alexander, Oldham.
Paisley	Mr. Charles Dalton Wason, Teacher, St. George's School, Paisley.
Pembroke Dock	Mr. T. H. Eastlake, H.M. Dockyard, Pembroke Dock.
Peterborough	Mr. C. T. Cotton, Long-causeway, Peterborough.
Poole	Mr. Robert Belben, Accountant, Longfleet, Poole.
Portsmouth	Mr. Andrew Murray, H.M. Dockyard, Portsmouth.
Richmond	Rev. W. Bashall, A.M., 3, Cambridge-villas, Richmond-hill, S.W.
Rotherham	Mr. Frederick Edwards, Solicitor, and Mr. W. Unwin, Currier, Rotherham.
Ryde	Mr. Benj. Barrow, F.R.C.S., M.B.M.S., Ryde.
Salford	Mr. Wm. Noar, Borough Treasurer, Town Hall, Salford.
Selby	Mr. William Allison, Bank Manager, Selby.
Sheffield	Mr. T. Rowbotham, People's College, Sheffield.
Skipton	Mr. George Kendall, Skipton.
Slough	Mr. James Chapman, Upton-grove, Slough.
Southampton	Mr. W. Johnson, Athenæum, Southampton.
Southern Counties' Adult Education Society	Hon. and Rev. S. Best, Andover.
South Staffordshire Union of Educational Inst. ...	Mr. J. Jones, The Trindle, Dudley.
,, Bilston	Rev. H. F. Newbolt.
,, Cradley	Rev. J. H. Thompson.
,, Dudley	Mr. J. Stokes, Solicitor, Dudley.
,, Handsworth ...	Mr. G. D. Boyle.
,, Kinver	Mr. T. Bolton.
,, Smethwick ...	Mr. F. Talbot, Messrs. Chance's Library, Smethwick.
,, Stourbridge ...	Rev. J. W. Grier, Amblecote.
,, Walsall	Rev. A. C. Irvine.
,, Wednesbury...	Mr. C. Britten.
,, West Bromwich	Rev. J. Whewell.
,, Willenhall ...	Mr. J. Bennett.
,, Wolverhampton	Mr. J. N. Langley, Mowbray House, Wolverhampton.
,, Wordsley	Rev. J. Boultbee.
Wakefield	Mr. W. S. Banks, Solicitor, Wakefield.
Warminster	Mr. F. Morgan, Warminster.
Waterford	Mr. James Budd, Thomas-street, Waterford.
Wellingborough	Mr. Thos. S. Curtis, Wellingborough.
Wigan	Mr. James Seward, Dicconson-street, Wigan.
Worcestershire Union of Educational Institutes.	Rev. Maurice Day, College Green, Worcester.
York	Mr. Chas. Cumberland, Inst. of Popular Science, York.
Yorkshire Union :—	
,, Acomb, near York	Mr. T. Copley, Acomb.
,, Eccleshill	Mr. B. Baxter, Eccleshill.
,, Eston Mines (Middlesbro')	Mr. W. Spencer, Eston Mines.
,, Farsley	Mr. D. Hainsworth, Farsley.
,, Hebden Bridge	Rev. W. Baldwin, M.A., Hebden-bridge.
,, Hunslet (Leeds)	Mr. W. Cox, Hunslet.
,, Idle, near Leeds	Mr. J. Hall, Idle.
,, Keighley	Mr. C. D. Hardcastle, Keighley.
,, Marske, near Redcar	Mr. J. Elstob, Marske.
,, Middlesbro'-on-Tees	Mr. W. Taylor, Mechanics. Inst., Middlesbro'-on-Tees.
,, Scarborough ...	Messrs. Thos. Shields and J Edmond, Mechanics' Institute, Scarborough.
,, Slaidburn (Clitheroe)	Rev. D. Jones, Slaidburn.
,, Stocksbridge (Sheffield)	Mr. H. Robertshaw, Stocksbridge.
,, Thirsk	Mr. J. G. Baker, Market-place, Thirsk.
,, Wilsden (near Bradford)	Mr. C. Petty, Wilsden.

The foregoing Programme of Examinations for 1865 is published in a separate form, and may be had gratis on application to the Secretary of the Society of Arts. A copy will be forwarded to each Institution and Local Board in a few days.

Proceedings of Institutions.

METROPOLITAN ASSOCIATION FOR PROMOTING THE EDUCATION OF ADULTS.—On Friday, the 5th inst., a conference was held at the house of the Society of Arts, between members of the committee of the Metropolitan Association and of the Ladies' Sanitary Association, to take into consideration certain proposals for the promotion of female education, especially in the subjects of needlework and domestic economy. Mr. Harry Chester, the chairman of the committee, in opening the conference said that her Royal Highness the Princess of Wales had been pleased to offer an annual prize, through the association, open to females of the working classes, and the conference was to take into consideration the conditions upon which the prize should be awarded. As the progress of sanitary reform greatly depended upon an appreciation of its benefits by the working classes, it was proposed to establish courses of lectures, classes for instruction, and examinations, certificates, and prizes in connection with the institutions in union with the association, in order to familiarise their members with the laws of health, the construction of dwellings, food resources, and the economy of cooking, savings banks, and co-operative societies, and such other matters as were of practical benefit to the working classes, and a knowledge of which subjects might be applied by themselves to the improvement of their social condition. The particular scheme they had in view was that lectures should be delivered on simple questions of domestic economy in various districts where working men's clubs, mechanics' institutions, or kindred associations were in existence; that local boards should be formed; that after the delivery of the lectures the working men's wives and daughters should be invited to form themselves into a class; and that there should be an annual examination of such classes, followed by the awarding of certificates and prizes for proficiency in domestic economy and needlework. The whole scheme was to be founded and carried out on voluntary principles, and it was proposed that her Royal Highness's prize of a bible, which would be of the value of £5, and be additionally prized from having her name written in it, should be given to the female candidate who, having the greatest number of marks in the examinations in elementary knowledge, should also obtain a certificate of proficiency in plain needlework. Various suggestions were then made as to the best course which could be pursued to carry the objects of the association into effect. It was unanimously agreed that the persons who would be most benefited and most easily induced to fall into the scheme would be young persons from 12 to 18, and that if habits of industrial competition could be promoted among that class, another generation would see the homes of the poor materially improved, waste avoided, and the resources of workmen made to go much further than they did at present. The most cordial approbation was expressed of the scheme, which will therefore be added to the forthcoming programme of the association.

WORCESTERSHIRE UNION OF EDUCATIONAL INSTITUTES.—A quarterly meeting of the committee of this Union was held on the 2nd July, when the annual report of the examiners for 1864 was submitted. From this it appears that this year there has been a falling off in the number of candidates and in the quality of the work done. The withdrawal of candidates from the Dudley and Stourbridge Institutes may partly account for this diminution in numbers. Candidates who have competed in the special and extra examinations are members of the following Institutes:—Bromsgrove Literary and Mechanics' Institute, Bromsgrove Church of England Girls' Night School, Dudley Mechanics' Institute, Hanley Castle Institute, Kidderminster Mechanics' Institute, Kidderminster Mutual Improvement Society, Kidderminster St. Mary's Night School, Redditch Night School, Stourbridge Mechanics' Institute, Stourbridge Church of England Young Men's Association, Worcester Co-operative Reading-room, Ebley Mental Improvement Society. In the Special Examinations, senior branch, there were eight candidates, six of whom selected Gospel History, one English History, seven Geography of British Isles. In the junior branch there were 28 candidates, 24 of whom selected Gospel History, 14 English History, 16 English Geography. For the extra prizes the subjects were:—1. Whately's Easy Lessons in Money Matters, for which there were seven candidates. 2. Health for the Household: nine candidates. 3. Geography of Palestine: six candidates. 4. Domestic Economy (for female candidates): three candidates. 5. Mechanical Drawing: three candidates. 6. English Composition. 7. Essays on Physical Education: two candidates. 8. Euclid: one candidate. 9. Colenso's Arithmetic: several candidates. In the course of the ordinary business the resignation of the Union's indefatigable honorary secretary, the Rev. Wm. Walters, was announced with regret, the rev. gentleman being about to remove from Hanley Castle to Oldham, Lancashire.

CITÉS OUVRIERES DE MULHOUSE.

The following is the substance of a report on this subject, addressed by M. Jean Dollfus to the International Philanthropic Congress, held in London in 1862:—

Mulhouse stands foremost among the industrial centres of France, and the praiseworthy efforts which the great manufacturers of that town have made to improve the condition of the working classes have been rewarded with the most satisfactory and gratifying results.

A society was formed in 1853, with a view to build small houses with gardens attached, to serve as dwellings for one family, and to be sold at cost price to working men only. Six hundred and eighteen houses have been successively built. These houses, very soundly constructed, are spacious enough to afford accommodation to families of six and eight persons. Their cost for the first years was between 2,000 and 3,000 francs. Now that more accommodation is required, and that the materials are at a higher price, they cost 2,600 francs for the smaller, and 3,600 francs for the larger ones. A term of sixteen years is allowed for the payment, and the purchaser must, before he takes possession of his dwelling, pay on account 300 francs. The remainder is to be paid by monthly instalments, of which the average does not exceed 25 francs.

Out of the 618 houses already built, 538 had been sold up to the end of August 1862. The sums received amounted to 650,000 francs, and more than fifty houses had been entirely paid up. The sale increases every year, and 255 houses have been purchased within the last three years.

When the society was started, many difficulties and prejudices had to be overcome. The working men had never thought of buying houses; they, for the greater part, lived in some sorts of filthy and unhealthy barracks, and the comforts of home-life were unknown to them. The example of those who have left their wretched abodes to live in the cheerful houses erected by the society, has made such an impression on the working population of Mulhouse, that every family now aspires to possess a little house of its own. The society hope to be able every year to build and sell from 80 to 100 of these houses, and this during a long period.

The workman who lives in the New Cités Ouvrières likes to remain at home. He tills his little garden during his leisure hours; and as he must be sparing to be able to pay for his dwelling, the public-house is no longer thought of. The population of the Cités Ouvrières is now about 5,000. The payments are made with the greatest punctuality, and the purchasers are often in advance. A fact worth mentioning is, that frequently young men who enlist in the army give to their parents the bounty which they receive from the government to be applied to the payment for the family house. More than twenty cases

of this nature have been recorded within the last two years.

The French Government, by a grant of 300,000 francs, has powerfully facilitated the development of the Cités Ouvrières of Mulhouse. This subvention has enabled the society to erect baths and washouses and an infant school, a cooking depôt and bakehouse, and other works of public utility—all devised for the greater comfort of the inhabitants of the Cités Ouvrières. As soon as new houses are constructed the society borrow on them for a term of 20 years.* Nothing is refunded during the first five years, and the society reimburse the money borrowed with the product of the sales. The interest paid is generally 4½ per cent. Stores of articles of clothing, and of household utensils and furniture, have been established by the society. Thus the working men are enabled to save much, whilst many well-contrived or improved articles come into general use. Wood is the kind of fuel preferred by the working population of Mulhouse, and the use of that fuel occasions for every family an extra expense of at least 60 francs per annum. But it seems likely that wood will soon be superseded by coal, the society selling the latter at reduced price, and supplying cheap stoves appropriated to its use. It is believed that, when the prejudice is got rid of, a yearly saving of upwards of 150,000 francs will be realized.

The Cités Ouvrières of Mulhouse have already been imitated in many manufacturing towns of the department of the Haut-Rhin, as well as in a small town of the Grand Duchy of Baden, where more than 60 houses have been built. The sale is everywhere satisfactory, and more houses are in course of erection. A certain number of houses on the plan of those at Mulhouse were constructed at Basle, in 1862, and the promoters of this movement contemplate enlarging the scale of their operations. In various countries and in many French towns, benevolent persons do their best to enable the working man to invest his savings in the purchase of a house.

An association has been formed at Mulhouse among the manufacturers in order to provide pensions for old working men, and to erect an asylum for the invalids of work. Large sums have been subscribed towards the establishment of this useful institution, and there are some manufacturers whose yearly contributions amount to 15,000 francs, and even 20,000 francs. More than 250 workmen at present receive a pension of from 150 to 250 francs per annum, and 15 old men find a shelter in the asylum, where accommodation for 40 is provided. There is besides a house where travelling workmen are supplied with food and lodging for one night. More than 4,000 men in search of work avail themselves every year of this charitable institution.

The population of Mulhouse is about 50,000, and there are ten infant schools in the town. The children of the working people receive in these establishments their first education, and the habits of cleanliness and order which they contract there contribute in a great measure to their future welfare. When they leave the infant school they are sent to one of the parish schools, where their education is completed.

The baths and washhouses have proved a great boon to the working classes of Mulhouse. Owing to the fact that the hot water is generally supplied by the boilers of the neighbouring factories, the expenses are not considerable. A charge of five centimes for every two hours is made for the use of the washhouses and drying-rooms, and a very comfortable bath may be obtained at the price of twenty centimes, linen included. Although these charges are very low, the receipts exceed every year the expenses by 3,000 francs, which sum is applied to the extension and improvement of the establishment.

*It must be borne in mind that the capital of the society is but 350,000 francs.

Fine Arts.

Art Exhibition at Malines.—There is about to be held at Malines an exhibition of works of art of the Mediæval and Renaissance periods, contributed on loan from churches, convents, corporations, guilds, and private collections. The exhibition will be open from the 29th of August to the 25th of September. It is said that the collection will form the richest display of works of Flemish art ever brought together, many of them belonging to convents which can only be seen with difficulty at other times. Mr. Weale, of Bruges, has been entrusted with the carrying out the exhibition and the preparation of the catalogue, which is divided into ten sections, each arranged chronologically.

Fine Art in France.—The demolition of the western end of the grand gallery of the Louvre has been commenced with vigour, and is to be rebuilt in harmony with the remaining portion, the work of Henry IV., which presents so great a contrast to the heavy, tasteless portions built by Louis XIV. and Napoleon I. The great mass of the pictures of the Flemish and later schools have in consequence been withdrawn for a time from exhibition, but some of the master-pieces of Rubens have been placed in the *salle d'état*, which connects the great gallery with the new ones now occupied by works of the French schools. Another gallery, to be called the Little Gallery of Napoleon III., and situated in the upper portion of the new Louvre, is now being prepared to receive the works of Lesueur, Joseph Verney, and other French painters.—The Delacroix exhibition, an interesting collection, which is being made by the *Société Nationale des Beaux Arts*, will be opened shortly in the gallery of the Boulevard des Italiens. The government has granted the loan of the works of Delacroix at the Luxembourg and Versailles, and the local authorities of Nantes, Tours, Nancy, Rouen, Lyon, and Arras, and several private individuals, have followed the good example; it is known, however, that difficulties have been raised in other quarters, and that the opening of the exhibition has been delayed thereby. This collection is looked forward to with much interest, as the peculiar style of Delacroix places his work at a great disadvantage in a general exhibition.—The Limoges exhibition has been highly successful, and the purchases amount to 40,000 francs. The Emperor sent two gold medals, which were given to MM. Richard and Amaury Duval. At Perigueux, on the other hand, the exhibition has been a comparative failure, and the poor class of works exhibited—or the low state of taste in that quarter—is shown in the fact that the average price of the pictures sold did not reach ten pounds.—A most remarkable fact at the present moment is the immense number of public statues erected or in progress; the illustrious subjects are not confined to any period or class. Nogent-sur-Marne raises one to Watteau; Sanites, to Bernard de Palissy, the potter; Vichy, to Madame de Sevigny, who first brought its springs into vogue; Nantes, to the late Minister Billault; Boulogne-sur-Mer, to Dr. Jenner; Paris, to the deceased painter Flandrin; Tarbes, to Baron Larrey, Napoleon I.'s army surgeon and favourite; Nimes, to its local celebrity, the Poet Reboul; Saint Malo, to Chateaubriand; Colmar, to Admiral Bruat; and Orange, to Comte de Gasparin, formerly Minister, Prefect of Lyons, and a great friend to agriculture. This last statue is now to be seen at the entrance of the square of the Louvre, opposite to the Institut. The practice, common in Paris, of thus exhibiting the works of the sculptor in the metropolis before they are sent to the provinces, is one from which the artists of other countries might take a hint. It is gracious, and a legitimate means of publicity.—An able sculptor, Aristide Husson, died recently at Bellevue, near Paris. M. Husson was born in Paris, in 1803, and was a favourite pupil of David d'Angers. There is a fine group at the Luxembourg from his hand, "The Guardian Angel Raising a Repentant Sinner;" and

amongst his other works are the fine colossal figures of Summer and Autumn, in one of the great fountains of the Place de la Concorde; statues of St. Bernard, at the Madeline; of Saint Louis, of Marguerite de Provence, of Philippe le Hardi, and of Marshal Suchet, at Versailles; a fine figure of Haydée, in the Grenoble Museum; and many statues on the new Louvre and other public monuments. M. Husson was also a man of both literary and scientific attainments.

The Copyright Act of Engravings.—An action was recently brought in the Westminster County Court, by Mr. M'Lean, against a shopkeeper in High Holborn, named Hall, to recover compensation for an infringement of the Copyright Act of Engravings, by selling a print of the "Prisoner's Widow." The damages were laid at £10. The plaintiff stated that he had paid £700 for the engraving of the plate of that picture, and £150 to the artist for the copyright, making £850. The print had since been photographed, and the piratical traffic had been carried on to such an extent as to do incalculable injury to the publishers, who spent such large sums of money. The judge considered that the defendant had rendered himself liable under the Act, and accordingly made an order for the amount of damages claimed and costs amounting altogether to about £50.

Antwerp Exhibition.—This was announced to open on the 7th of August; the number of works sent by French artists is about 150, and the list contains some good names, though very few belonging to the front rank.

Brussels Exhibition.—The *Société du Cercle Artistique et Littéraire*, with a view to the encouragement of young artists, has placed at the disposition of the directors of the exhibition the sum of four hundred francs, to be divided into two prizes, one to be given to the best study in oil, of a head, the other to the best landscape, marine piece, or sketch of animals, both after nature. The best six of each kind to be exposed during the whole time of the exhibition

Manufactures.

Steam Boiler Explosions.—The Engineer's report for June, made to the Manchester Association, says that during the month 272 engines have been examined, and 419 boilers, 22 of the latter being examined specially, and one of them tested with hydraulic pressure. Of the boiler examinations, 364 have been external, 8 internal, and 47 thorough. In the boilers examined, 154 defects have been discovered, two of them being dangerous. In two cases of fracture, described as dangerous, the fractures occurred at the seams of rivets at the bottom of externally-fired boilers. The double thickness of plate at the overlap of these boilers appears to be unable to stand the duty assigned to it, and cracks, in consequence, start from the rivet holes. These cracks are not confined to the outer overlap, but frequently run from rivet hole to rivet hole in the inner one, and thus so weaken the plate that the boiler rends in two. Another case of fracture took place at the crown of a furnace tube of an internally-fired boiler, in consequence of strengthening hoops having been added without intermediate ferules. Though such cracks in the furnace crown of an internally-fired boiler may entail the expense of repair, there is no danger, as with those at the bottom of an externally-fired boiler, of their leading to explosion. Four cases of external corrosion, described as dangerous, all occurred in internally-fired boilers, and were only discovered on going up the external brickwork flues, which shows the importance of "thorough examinations." One of these boilers was set upon a mid-feather, and found to be corroded throughout a considerable portion of its seating; while the plates of another differently set proved to be eaten away to the thickness of one-thirty-second of an inch where concealed by the front cross wall. Three of the cases of internal grooving are worth remark. Grooving is very constantly met with encircling the furnace mouth angle-irons at the front end plates of internally-fired boilers, but in two of the instances in question it attacked three or four of the transverse seams of rivets at the crown of the furnace tubes, completely undermining the overlap of the plate; while, in the third instance, the grooving occurred at the ring seams at the bottom of the shell, and at the immediate vicinity of the feed inlet, showing the contraction of the metal produced by the too local entrance of the water, and the consequent importance of dispersing it by means of a perforated pipe. One explosion, resulting in the death of one person, occurred at an ironworks to a plain cylindrical egg-ended boiler, fired externally, and not under the inspection of the Association. The boiler was one of a series of five connected together, and working side by side, being No. 4 from the left hand. Its length was 40 feet, its diameter 6 feet, and the thickness of the plates three-eighths of an inch, while the pressure of the steam was 35℔., which was quite moderate for a boiler of such dimensions. It had rent into eleven fragments, which were scattered in every direction. The character of these rents was peculiar. The majority of boilers of this class divide into two parts at one of the transverse seams of rivets, but this one had not only rent transversely, but also longitudinally, from one end to the other, so as to divide the boiler in the main into four nearly equal parts, while these were again subdivided, and the shell ultimately broken up into eleven pieces. These rents were by no means confined to the lines of rivets, but had run through the solid plates entirely regardless of them, in many cases continuing for several feet within a few inches of the overlaps, and though so near, yet without running into them, but continuing in a straight line parallel to them. Indeed, there was scarcely a line of rivets disturbed, and some of the smaller fragments were torn out of the heart of the larger plates without a single rivet upon them. The boiler had been originally plated longitudinally, but on the seams over the fire giving way some time since, it had been repaired with three widths of plate laid transversely. These plates, which were 3 feet wide each, extended to a short distance behind the fire bridge, and it was at the ring seam of rivets that connected the new plating laid transversely, with the old laid longitudinally, that the primary rent occurred, and which it will be seen was situated, as is so usual in these cases, near to the bridge and at the bottom of the boiler; while the anomalous manner in which the boiler had rent was due to the combination of the transverse and longitudinal modes of plating. The manager of the works stated that their externally-fired boilers were a source of constant annoyance and expense, through getting out of repair, and it was no uncommon thing for one of the ring seams, a little behind the fire bridge, suddenly to rend through the line of rivet holes, merely in consequence of the slight change of temperature induced on the stokers' cleaning out the fires with the door open. The fact of these externally-fired boilers being ever found to give way in this treacherous manner, seems a sufficient reason to condemn them, especially at ironworks where the value of the charge of metal in the blast furnaces, which far exceeds that of the boilers, is jeopardised by them. Another explosion took place at a colliery. In this instance three persons were killed, and three others injured; while the boiler, which was not under the inspection of this Association, was the outer one of a series of three, and, as in the case of the previous explosion, was of plain cylindrical egg-ended construction, and externally-fired. The boiler, which was plated longitudinally throughout, was 32ft. long, 6ft. 6in. in diameter, and made of plates three-eighths of an inch in thickness, the pressure of steam being 35lbs. per square inch. The primary rent occurred at a longitudinal seam of rivets over the fire, which, after running in a straight line for some feet, developed transversely, dividing the shell into three fragments, all of which were thrown to a considerable distance from their original seating; while in addition, the adjoining boiler was dislodged, and turned up on end by the force of the

explosion. When it is stated that the plates at the fractured part proved to be very defective, and also that this boiler had leaked for some time at the seam over the fire, so that the introduction of bran had been resorted to in order to stop it, it will not be necessary, after what has already been said on the danger of these external-fired boilers, to add anything further to account for this explosion; while it will appear that these boilers, whether plated longitudinally, as in the present instance, or transversely as according to the more usual practice, are alike prone to explosion. A third explosion, by which one man was killed, was due to the collapse of the combustion chamber of a boiler of the double furnace or breeches class, working at a flour mill, and which was not under the inspection of the Association. The boiler was the left hand one of a series of three, the shell being 7 feet in diameter and 26 feet 6 inches long; while the diameter of the furnaces was 2 feet 9 inches, and that of the flue 3 feet 3 inches; the length of the combustion chamber being 4 feet 6 inches, the thickness of the plates three-eighths of an inch, and the steam pressure 45lb. The collapse of the combustion chamber had taken place, not at the crown but at the underside, and this arose from the fact, that while the crown was stiffened with roofing stays, assisted by tie rods connected to the shell of the boiler, the bottom of the combustion chamber was comparatively unstayed, having but a single angle iron running longitudinally on the centre line, in addition to a small gusset on each side. These breeches or combustion chambers have already proved a very fruitful source of explosion, and it is important that those who employ boilers of this construction should have these chambers stayed with vertical water tubes, which act as internal columns or struts, and thus prevent the top and bottom plates of the chamber coming together; while, in addition, it is frequently, if not always desirable, that the flue should be encircled with an angle iron hoop just at the waist or termination of the breeches piece. In some cases, where the pressure is low, this hoop of itself would be sufficient, and under many circumstances would perhaps be more easily obtained than the water tubes. An explosion occurred to the boiler of a locomotive engine while attached to a passenger train just after it had stopped at a railway station. The engine was of the ordinary type for passenger traffic, and built in the year 1849. It was not under the inspection of the Association. The boiler rent in the barrel or cylinder portion of the shell, which was composed of three belts or widths of plates. The belt adjoining the fire-box was completely severed from the remainder of the boiler, having rent close to one of the overlaps at a longitudinal seam below water line, and also through the line of rivet holes of the entire ring seam on each side of it. This belt was flattened out and thrown to the right, while the seam dome, in consequence of the previous rupture, was torn away, and blown to a considerable distance; added to which, the crank axle was broken, the wheel on the right-hand side disturbed, and the tubes bowed outwards, the remainder of the boiler receiving but little damage. On examining the edges of the fractured plate it was clear that the primary rent had occurred at the edge of the overlap of the longitudinal seam of rivets, for there a deep furrow was found which had eaten away the strength of the plate. These longitudinal furrows are the most frequent source of locomotive boiler explosions, and there appears to be no other way of detecting the silent progress of these furrows in time to renew the weakened plates so as to prevent rupture, than that of making more frequent "Internal Examinations."

New Method of Hanging Doors.—Mr. George Fawcus, of North Shields, with a view to obviate the accidents that are liable to happen in the opening or closing of doors fitted as at present, proposes to form a groove (a segment of a quarter circle) on the back of the door, making it to revolve round the shaft of a pillar tube, or circular moulding, fitted to the door frame. The ordinary butt or other hinges at the back of the door, are to be replaced by pivot points, plates and screws, bands or crooks, at the top and bottom of the door, the combination acting like a rule joint, and so presenting no opening at the back, in whatever position the door is placed. The doors may also be hung in the centre of the side frame, and so present the same appearance of door and frame on both sides. The door frames may be made of wedge-shaped sections, to economise timber, as these may be cut obliquely from square pieces. More space will thus be gained in the doorway for anything of length passing through obliquely. There may be graceful curves, that is, rounds and hollows, instead of the mouldings with sharp corners, that so much increase the labours of the joiner, painter, &c. It is expected that doors thus fitted will be less liable to be affected by warping, and will move more easily. The ordinary bolts of spring locks may be made broader and rounded off with a bulb edge, through which a small level surface in the middle may be slotted out for holding, thus exposing no sharp corner or edge for contact in passing.

Locomotive with Eight Driving Wheels.—On the floor of the library of the Society may be seen a model of a locomotive engine with eight driving wheels, for sharp curves and steep gradients. The model is to a scale of one-eighth the full size. The frame is rigid, and is provided with eight driving wheels of differing diameters, so that the machine will *roll* freely round double reversed curves of one chain and a half radius. By this arrangement the total weight of the engine is rendered available for the purpose of adhesion, while the load is distributed over so many wheels as not to damage the rails. At the same time, by the application of a brake, to be operated by steam power, the whole of the eight wheels are retarded and set free rapidly by the driver putting steam on or off. The same machine is capable of being extended to twelve drivers if required. With the increase of steam power in the locomotive, the increase of adhesive wheels has become a very important consideration. This is recognised on the Great Northern Railway, where Mr. Sturrock applies steam cylinders to his tenders to obtain the adhesion of an increased number of wheels, and thus, it is said, is enabled to draw one half more load. By the system now shown the increased power of adhesion is rendered compatible with the sharpest curves. This is a class of engine structure long aimed at by our friends on the continent, who have to work in hilly regions.

The New Factory Act.—The objects of this act are to provide for the effectual cleansing and ventilation of factories, and to regulate the labour of children, young persons, and women employed therein. The factories to which it applies are those used for the manufacture of earthenware (except bricks and tiles), of lucifer matches, of percussion caps, of cartridges, paper staining, and fustian cutting. An occupier of a factory not kept in conformity with this act is to be liable to a penalty not exceeding £10 nor less than £3. With the view of furthering the act a master can make rules to ensure cleanliness and ventilation, which rules are to be approved of by the Secretary of State, and if a person employed in the factory should infringe them he is to be liable to a penalty of £1. The act provides that meals are not to be taken in factories used for the purpose mentioned, and also regulates the age of children to be employed, who are not to be under eleven years of age.

Life-Preserving Appliances.—There was a large concourse of people on the Seine and its quays the other day, when an exhibition was made in public of the efficacy of belts, waistcoats, mattresses, and other articles filled with cork in saving life in case of shipwreck. The articles in question were manufactured by a Parisian company, on the system of Dr. Ricard, who superintended the proceedings in person. The mattresses and various productions of this company differ from others composed internally of cork, in the fact that they are divided into

separate portions, so that, like a ship built with water-tight compartments, a local injury does not materially interfere with the general value of the article. The mattresses, for instance, are composed of ten or twelve transverse divisions, the ticking or other material serving for the case being continuous on the one side and indented on the other, to the whole thickness of the cork-stuffing, so that the mattress is composed of so many parallelograms hinged together on one side, and can be folded up with great ease and convenience for stowing away or for transport. The stuffing consists of cork in powder or in shavings, the former being used where greater softness is required, and the latter in ordinary cases, and these are prepared by means of special machinery arranged for using up waste cork of all kinds, a very important consideration in an economical point of view. The exhibition which took place the other day had for its principal object the exhibition of the value of cork mattresses as life preservers; a number of these were thrown upon the water, and a mattress, six feet by three, supported a man sitting, lying, or kneeling with perfect ease; even the narrow mattresses used on board ship, not more than fifteen inches wide, possess buoyancy enough to sustain a man of moderate weight, and, when fitted with straps and buttons, form a most valuable life-belt. The ordinary sized mattress for one person, containing about twenty pounds of cork, will sustain two men in the water without difficulty. After various experiments had been made with the cork mattresses, belts, and waistcoats singly, a dozen of the first-named articles were strapped together to form a raft, which carried a number of men from the Pont Royal to the Pont de la Concorde, amid the cheers of the assembled crowds. Similar exhibitions have taken place at Biarritz, Dieppe, Cherbourg, and elsewhere, and it is understood that the Company enjoys the patronage of the Imperial Marine.

Commerce.

International Money Orders.—The French and Italian Governments have taken the initiative in a matter of great importance to those who have relations with foreign countries. The commercial world has provided for itself the means of transmitting money from one country to another, and for all but very small sums the system is complete. When, however, the amount to be remitted is below what is considered as a commercial quantity, the trouble of making a payment is out of all proportion to the business to which it relates. To meet this want the government of France and Italy have concluded a convention for the establishment of money orders between the two countries. The amount is limited to 200 francs (£8); the fees are fixed at the rate of 20 centimes per 10 francs (about 2d. for 8s.), or for any fraction of that sum which are to be paid by the sender, and no other fee or tax of any kind to be charged on any pretence whatever. Moreover, these money orders are to be transferable by endorsement. The date when this convention is to be put into practice is not yet announced. It is difficult to perceive any reason why this new arrangement should not work as easily as any other function of the Post-office, and it may be regarded as the first step in an important and popular commercial reform. In connection with the system of money orders in general, it may be observed that while the tax is at present greater in Paris than in London, the orders issued by the French post-office have the great advantage of being payable at any one of the money-order offices in the town, according to the convenience of the recipient.

Mining Statistics.—From the returns of Mr. Robert Hunt, F.R.S., the Keeper of the Mining Records at the Royal School of Mines, it appears that the value of the minerals produced in 1863, was £29,151,976, from which metals of the value of £36,364,327 were extracted. Of gold quartz there were produced 385 tons, worth £1,500; of tin ore 15,157 tons, worth £963,985; of copper ore, 212,947 tons, worth £1,100,554; of lead ore, 91,283 tons, worth £1,193,530; of silver ore 88 tons, worth £5,703; and of zinc ore, 12,941 tons, worth £29,968. During the same year there were sold 95,376 tons of pyrites, for £62,035; and the rarer minerals—wolfram, uranium, gossans, arsenic, and earthy minerals raised, were of the value of £1,980,866. These items, with the value of 9,101,552 tons of iron ore, £3,240,890, and 86,292,215 tons of coal, £20,572,945, raise the total to £29,151,976, which was manufactured into nearly £40,000,000 worth of merchantable produce. To produce these results direct employment has been given to at least 500,000 men, so that the mineral industries of the kingdom may be considered as alone supporting a population of nearly 3,000,000.

Coal in the Southern States.—An American paper says that there are extensive coal mines lying on both sides of the James river, a few miles above Richmond, being about twenty miles from north to south, with an average breadth of five miles. The coal is bituminous, and it has been largely used for steam purposes and for the production of gas. These mines were probably the earliest worked of any in the United States, mention being made of them in the *American Journal of Science* of 1818, as having been in operation for thirty years previously. The works, as now carried on, are at a great depth, the deepest shaft sunk being about 800 feet. Anthracite coal mines have been opened within a few years in Montgomery, Pulaski, and Wythe counties, and also along the range of mountains in the western part of Augusta county. In Brush Mountain, along the north-western line of Montgomery county, and in Price's Mountain, six or seven miles south-east of this, some very good coal is mined. The amount of coal mined in Virginia during the year 1860 was 382,000 tons, valued at about 700,000 dols. at the mines. There are extensive beds of bituminous and semi-bituminous coal in North Carolina, in Chatham and Moore counties in Deep River. There are also extensive beds of semi-bituminous coal in Rockingham and Stokes counties, on the Dan River. The only mines of importance in Southern Tennessee are on the Sewanee River.

Auction Sale of Shares in India.—The Indian journals give an account of an auction sale of Back Bay Reclamation Company's shares at Bombay. The profit realised on the 400 shares sold amounted to upwards of a million sterling. The average profit was Rs. 26,345 per share. The company therefore will start with a reserve fund of 50 per cent. on its proposed capital. The sale produced most extraordinary excitement. A Parsee acted as auctioneer, and most of the bidders were natives. The first share was knocked down for 24,500 rupees, but the price speedily rose to 30,000 rupees, and then to Rs. 35,000, at which price a goodly number were sold. The fact of 400 shares of a company which has not, nor is likely to commence operations for some time to come, fetching such an enormous premium, is probably without a precedent.

Colonies.

The Financial Position of New Zealand appears to be such as at present not to require any additional taxation by an increase of customs duties. A colonial paper maintains that if at a later period this be the case, and the treasurer's accounts should show a deficiency, the Province of Auckland, "which is the only one that reaps material benefit from the war," ought to be called upon to make good, at least to a considerable extent, the deficit produced by the war expenses. "Thousands of military settlers are to be brought to Auckland at the cost of the colony. Millions of acres of fine land, obtained from the natives by way of confiscation, will secure to

Auckland the means of offering inducement to immigrants to come, and for capitalists to invest their capital in that colony. It is only just that, as Auckland is the only gainer by the war, it also should contribute a larger share towards the expenditure which the war has already entailed upon us."

Building in Melbourne has been proceeding with great rapidity. New and very handsome houses, shop-warehouses, and stores are taking the place of old and incommodious structures. In every street evidences of industry in this direction are presented. The building trades never were more fully or profitably occupied.

The Canadian Trade.—The official statement of the arrivals and tonnage of ocean vessels at the port of Quebec, up to the date of the departure of the royal mail steamship Hibernian, shows a falling off of 247 in the number of vessels, and decrease of 115,653 tons in the aggregate tonnage—the aggregate number being in 1864 533 ships of 290,626 tons, against 780 vessels and 406,279 tons. The same returns show that up to the 7th of July in the present year 12 steamers (ocean) arrived at Quebec, of an aggregate of 16,902 tons, against the same number of steamers of 17,417 tons—an increase in the tonnage of 505 tons. The coasting trade of Quebec has also shown a decrease, the numbers being in 1864, 33 vessels of 2,636 tons, against in 1863, 40 vessels of 3,625 tons, a falling off of 7 vessels and 980 tons.

Finances of Natal.—Twenty years ago, when Natal first became British territory, its revenue at the end of the first year amounted to £830. Five years later it was £9,268, in five years more £28,648, at the end of another five years £42,800 and in 1863 it reached £123,089—an excess of more than £6,000 over that year's expenditure. The growth of the revenue is stated to be in great part due to the population drinking and smoking more. It is calculated that the European population paid in 1863 taxes to the amount of £5 per head. Yet the expenditure for education, roads and bridges and public works, immigration, and mail carriage—barely exceeded £30,000.

Obituary.

Edwin Ward Trent was born at Penn Mill, Yeovil, Somersetshire, October 24th, 1810. His grandfather was governor of Ilchester prison for more than thirty years. When quite a boy he had a taste for making canals, drains, &c. When about arriving at manhood, he formed an ardent desire for a seafaring life, but his mother being averse to it it was abandoned, though with long-continued regret. He then adopted the trade of rope, line, and twine making, in which he excelled, and which furnished him with a wide and congenial field for experiment and invention. He produced a machine for coiling ships' cables, which it was till then asserted could never be done. He introduced several improvements in the machinery for spinning yarn for rope-making, and machines made on his system are now extensively used. Some of these machines were shown at the late International Exhibition. At the Great Exhibition of 1851 he gained a medal for the preparation of New Zealand flax (*Phormium tenax*) and fishing-lines made of it; and, at Sir W. Hooker's request, the specimens were deposited in the Museum at Kew-gardens. He was the original inventor of machinery for extracting the long fibre from the husk of the cocoa-nut, upon which he spent much time and money. While manager of the Park Hemp Works, at Old Ford and East Greenwich, he made great improvements in spinning machinery, besides inventing a machine for finishing twine, which increased the economy of working and diminished the waste. The activity of Mr. Trent's mind was shown in various other ways. He was the promoter of several companies for encouraging the growth of hemp and flax, and assisted in the formation of the Intercolonial Steam Navigation Company. He also exercised great influence in the direction of emigration. He was fond of travelling, and in Canada and the United States alone he journeyed over 6,000 miles; having travelled also in many other countries. Some years ago he published a "Tract" on the subject of training boys who had not been convicted of crime, on a self-supporting system, for colonial life. He had been a member of the Society of Arts for about thirteen years, occasionally contributing a paper for insertion in this *Journal*. He died at his residence, at Homerton, March 22, 1864, in the 54th year of his age.

Publications Issued.

Dictionnaire de Chimie Industrielle, by Messieurs Barreswill and Aimé Girard, in five volumes octavo. (*Ferdinand Tandon et Cie.*, Rue des Ecoles, Paris.) This work, as the authors say in the preface, is not, strictly speaking, a dictionary, but partakes of the mixed character of a dictionary and a treatise. The object of the work is to give detailed descriptions of the industries which are based upon the phenomena of chemistry. These industries are classed in alphabetical order, and are explained at length, including the putting up of factories and the necessary machines, utensils, and plant, as well as the materials used, produced, and derived from them, and the method of working them. Messrs. Barreswill and Girard have associated with themselves in the undertaking men specially known in their several branches of knowledge, so as to render their work as far as possible an exact representation of the chemical industry of the period. The dictionary is comprised in four volumes, the fifth volume being an introduction, in which is given the elements of those sciences of which industrial chemists should have knowledge. Among the contributors to the book, intermingled with the names of Barreswill and Girard, will be found that of Gannal, attached to an article on the preservation of organic substances; of Bouilhet, the distinguished son-in-law of Christofle (electro-chemical deposits); Maumené (oils, &c.); Reveil (milk, butter, cheese, &c.); Kop (metals in ordinary use); Ste. Claire-Deville and Paul Morin (aluminium); Vée (pharmacy); Davanne (photography); Salvétat (pottery); Balard (products of saline springs); Peligot (glass and enamel); Barral (wines and spirits), and many others, including Berthelot, Colin, Perrault, Schlösing, Riche, Lesieur, Lucas, Sobrero, and Girardin. Mons. Girard furnishes the articles on acids, alkalis, minerals, nearly all the chemistry of metals, waters, lighting by means of fatty bodies, essences, ethers, &c.; Barreswill the articles on paper, phosphorus, colours, gelatine, glue, &c. The work generally is intended specially for the use of manufacturers and managers of works who desire to make themselves thoroughly acquainted with the science and practice of the business in which they are engaged.

Metric Tables, in which the British standard measures and weights are compared with those of the Metric System, by C. H. Dowling, C.E. (*Lockwood and Co.*). This work, which was announced in a former number, is now published, and is thus arranged:—First there is a short history of our own standards of weight and measure, ending with a table of legal denominations; then a similar sketch of the origin of the standard of the Metric System, with a table of the system appended as in the preceding case; next follows the comparison between the two systems, forming the "Data for the Tables," in which the equivalents between the two systems are given reciprocally for every denomination of weight and measure, from the lowest to the highest. In this portion of the work the equivalents are taken sometimes to the full extent of decimals, but always to a large number, to ensure accuracy in the results for the tables. Authority is given at every step for the correct origin of the fundamental numbers by quotations from official docu-

ments in which they may be readily found. The detailed and "ready reckoning" tables follow, forming the bulk of the work, and are perfect as far as the exchange between the two systems of the "statute" denominations in each; sixty-four tables are required for this purpose, some of them extending, under the same head, for seven pages, in order to reach the higher amounts likely to be sought. Miscellaneous tables are added, such as pounds on the square inch converted to kilogrammes on the square centimetre, &c. An elaborate thermometric table of Fahrenheit's, the Centigrade and Reaumur's thermometers, with a table of comparison between the English and Metric barometers, close this onerous undertaking. This is the first work of its kind published, and it appears to be in every respect equal to any of the works which have been published by the governments of nations on adopting the metric system permissively.

Notes.

Ancient Roman Calendar.—One of the latest acqui sitions to the Neapolitan Museum is a Roman calendar disinterred at Pompeii, in the neighbourhood of the Gate of Isis. It consists of a square block of white marble, having on each of its four sides the information relating to three months of the year. First come the signs of the Zodiac, followed by the number of days in each month, and the indication of the nones. The hours of day and of night are carefully marked. At the periods of the winter solstice are read the words *hiemis initium.* All the above-mentioned particulars are drawn up in perpendicular columns. There are besides instructions respecting the principal agricultural operations to be undertaken in each month, with the names of the divinities to be worshipped, and the religious festivals and rites to be observed. On the upper surface of the block is the engraved figure of Apollo driving the car of the sun, and on the lower surface, Ceres gathering ears of corn in a field.

Lead-poisoning of Cows.—Mr. V. Tuson, Professor of Chemistry in the Royal Veterinary College, in a letter to the *Star* says:—"In May last three cows, the property of Mr. Mullins, of Rugby, died, after exhibiting symptoms which could not be referred by Mr. Watson, the veterinary surgeon consulted, to any disease with which he was acquainted. On making a *post-mortem* examination of the cows fragments of lead were found in their alimentary canals, especially in the reticuli or paunches. It was then remembered that the whole of the cows affected, although they had from November, 1863, up to the period of their death in May last, been pastured at a distance from the butts of the Rugby Rifle Volunteer Corps, had, prior to November, 1863, been kept in a field adjoining these butts. This field was carefully examined by Mr. Watson, and among the herbage he discovered fragments of lead which corresponded in every way with those found in the stomachs of the cows. Now the lead here referred to is that which had been scattered from the targets consequent upon the impact of bullets, and is called 'bullet spray.' Some of this spray had been evidently picked up by the cows while feeding, it remained in their stomachs several months, where, during that time, it slowly, but continuously, underwent solution and subsequent absorption into the system, and so, doubtless, poisoned the animals in question. Since the death of the three cows, the owner has lost two more, under precisely the same circumstances as those already related. The viscera of one of the cows which died last were sent to me for analysis, and I was enabled to demonstrate the presence of lead, not only in the coats of the stomach and intestines, and in their contents, but likewise in the liver and kidney, thus proving the passage of that poisonous metal into the circulation. I also had an opportunity of examining the bullet spray, which enabled me to ascertain that most of it was encrusted with a pale drab-coloured substance, composed chiefly of carbonate of lead, a highly-poisonous plumbic compound. It was this carbonate of lead which, I believe, more immediately caused the death of the cows."

Subaqueous Navigation.—The Messrs. Russell are now engaged in the manufacture of an extensive and very novel order for the Russian Government, who seem to have resolved upon making that country a great maritime power. A fleet of war vessels to sail under the surface are now being constructed for Russia. To afford some idea of the magnitude of the Russian enterprise, it may be stated that the cost of the tubes alone for a single vessel of this submarine fleet, will be nearly £9,000. It will contain no less than thirty-eight lengths of wrought-iron tubes of sixty feet each, having a 13-inch bore, and a thickness of seven-eighths of an inch. The specifications demand that they shall be capable of bearing a pressure of 2,000lb. to the square inch, and Messrs. Russell test every tube up to 2,500lb. The submarine boat which these tubes are destined for, is of such dimensions that it is estimated that 200 tons of iron and steel will be used in its construction. The cost will, it is calculated, reach 175,000 silver roubles, or £27,000, and the expenditure of this amount has been authorised by the Emperor. Each vessel is to have engines worked by compressed air, and to have a very strong break with provision for attaching large cylinders, charged with powder, to the bottom of vessels, to be fired by electricity. The parties navigating the vessel will see what they are doing by means of "bulls' eyes," and they will be able to regulate the depth at which they swim, generally keeping quite close to the surface.

Correspondence.

Water Supply of Naples.—Sir,—I read in your *Journal* of the 8th of July, a report of Mr. John F. Bateman, civil engineer, upon the project of Signor Felice Abate, of Naples, for supplying that city with water. Having occupied myself with this subject, it is one with which I am well acquainted, and I wish to point out, for the information of your readers, in the cause of exactitude, that the data upon which Mr. Bateman has drawn his conclusions cannot be accepted as correct by those accurately acquainted with the subject. First—The length of the Roman aqueduct of Claudius is 53 English miles from Naples, not 47, as might be inferred from the report, the exact length being 80 kilometres. Secondly—The aqueduct of Claudius was constructed now more than eighteen centuries since, and was first destroyed Anno Domini 70, the epoch of the first eruption of Vesuvius, which destroyed Pompeii and Herculaneum. Nothing but the two tunnels, formed through hills of rock, now remain intact, if, indeed, these tunnels can be fairly admitted to be so. One of these tunnels is only two kilometres, and the other six kilometres long, out of the whole length of eighty kilometres. The state of the preservation of the remaining portion is more than problematical; indeed, the route of the aqueduct must be mainly traced by its ruins. How, indeed, could such a work be expected to resist the effect of weather, and the vibration the earth is subject to in these parts, for more than eighteen centuries? Leturi, even in the sixteenth century, estimated the simple repairs of the aqueduct at two million dollars, or 9,500,000 frs., which, taking the then greatly increased value of money into consideration, would now give a very much larger sum. Thirdly. With respect to the quantity of water yielded by the springs of Serino. During last year, about November, 1863, a commission, specially nominated by the Council of Naples for the purpose of studying the question of the water supply in general of Naples, measured the quantity of water yielded by the springs of Serino, which were then found to yield only 4,845,700 gallons per day. It is true, that in 1861, Mr. Abate measured the springs

of Serino, and reported them to yield 8,733,552 gallons per day. Still, for the supply of Naples the lowest yield must be taken into consideration. The daily quantity of water required by Naples, estimated by Mr. Bateman at from 12 to 15 million gallons per day, over and above the 4,845,700 gallons, must be therefore provided for. This leaves, according to Mr. Bateman's lowest estimate, a daily quantity of 7 million gallons still to be provided for, or, according to the highest estimate, 10 million gallons. As to the possibility of augmenting the supply, as proposed by Mr. Bateman, by collecting the surface water draining from the surrounding mountains, into monster store reservoirs, even could this be done in a country like Naples, where the temperature is high, the water, necessarily mixed with impurities derived from mountain torrents, would lose its freshness, and serious inconveniences hygienically would result. The principal element of success in an enterprise of this nature at Naples, would be the preserving the freshness and the wholesomeness of the water. Fourthly—As to the revenue proposed to be derived from the use of the fall of the water of the aqueduct as a motive power, I am utterly at a loss to conceive how such a revenue is to be obtained, knowing, as I do, the industrial resources of this country. There is an abundance of hydraulic power in the neighbourhood of Naples, with infinitely preferable conditions or advantages, as it is situated near the sea. Besides, the salubrity of the water must necessarily be more or less injured if works and factories are to be established along the course of the aqueduct intended for the alimentation of a great town.—I am, &c., Count de la Tour de Bruil, Civil Engineer.

Turin, 27th July, 1864.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 14th July*, 1864.

11. (I). Weights and Measures (Metropolis)—Further Return.
410. Civil Bill Processes, &c. (Ireland)—Returns.
456. Transportation from the Channel Islands—Memorial.
476. Postage (Australia and New Zealand)—Return.
477. Postage (Australia)—Letter.
200. Bill—Portsmouth Dockyard (Acquisition of Lands) (amended).
Gold Coast (Military Operations)—Plan.
New Zealand—Further Papers.

Session 1803.

493 (VII). Import and Export Duties—Return.

Delivered on July 15, 1864.

369. Government Property—Return.
466. Schools of Art—Report.
468. Education (Inspectors' Reports)—Report.
469. Chamber of London—Annual Accounts.
472. Superior Courts of Law—Return.
486. Public Works (Manufacturing Districts) Act (1863)—Report.
202. Bills—Armagh Archiepiscopal Revenues.
203. ,, Justices Proceedings Confirmation (Sussex).
204. ,, Public Works (Manufacturing Districts).
207. ,, Drainage and Improvement of Lands (Ireland) (Supplemental).

Patents.

From Commissioners of Patents Journal, August 5th.

Grants of Provisional Protection.

Agricultural implements—1764—F. W. Turner.
Artificial fuel—1842—D. Barker.
Bottles, &c., machinery for washing—1782—T. Johnson.
Breweries, &c., apparatus employed in—1841—F. Gregory.
Bricks and tiles, machinery for making—1865—J. Slater.
Buckles, hooks, &c.—1872—R. Couchman.
Cannon, &c., construction of—1832—R. A. Brooman.
Carts, &c.—1610—W. Stevens.
Cements—1780—I. Swindells.
Climatic apparatus—1849—J. Jeffreys.
Cocks, taps, and valves—1877—A. Prince.
Cotton, cleaning from seeds—941—H. Higgins.
Cotton, cleaning from seeds—1825—J. Higgins.
Cylinders, manufacture of—1852—E. Peyton.
Dredging or excavating machines—1863—G. Furness and J. Slater.
Drinking vessels, arrangement applicable to—1859—F. L. Lyne.
Eggs, preservation of—1642—T. Nichols.
Electro-telegraphic apparatus—1823—A. V. Newton.
Fabrics, treatment of printed or dyed—1814—A. Barton, J. Sidebotham, and T. H. Nevill.
Felted cloth, manufacture of—1835—J. Barcroft.
Fibrous materials, twisting and doubling—1824—A. Topp and J. Holt.
Filter—1799—A. Espirat and E. Sauce.
Fire-arms, breech-loading—1774—G. Davies.
Fire-arms, breech-loading—1816—J. R. Cooper.
Fire-arms, breech-loading—1844—T. Wilson.
Fluids, &c., raising and propelling—1758—J. Bernays.
Freezing mixtures, apparatus for agitating—1821—J. Whitford.
Gas lamps, lighting, &c.—1792—T. C. Ebdy and M. Burdon.
Human diseases, applying chemical fumigations to the treatment of—1784—A. A. Bonnet.
Iron and steel, furnaces for heating and smelting—1786—J. Clayton.
Luggage, &c., checking the weight of—1810—W. E. Gedge.
Machinery, facilitating reciprocating movements of—1776—J. Gill.
Machines, packing for—1708—G. Hartshorne.
Marking ink, manufacture of—1828—J. Moller.
Metals, composition for preventing the oxydation of—1804—H. E. F. De Briou.
Motion, apparatus for transmitting—1802—T. Bourne.
Motive-power—1010—B. W. A. Sleigh.
Motive power—1850—J. P. Ravard.
Mowing and reaping machines—1794—W. McI. Cranston.
Mowing and reaping machines—1851—W. E. Newton.
Mules, self-acting—1862—L. R. Bodmer.
Musical instruments—1773—M. Henry.
Oils, means of decongelating—1827—W. E. Gedge.
Ordnance, &c., breech loading—1760—J. Needham.
Ores, drying and calcining—1815—E. Young.
Paper, &c., printing and perforating—1874—V. Wanostrocht.
Paper-hangings, manufacture of—1756—R. Smith and J. Booth.
Paper, manufacture of—1870—J. and W. Olive and E. Partington.
Pianoforte and harmonium, combined—1800—E. Lea.
Pig iron, manufacture of—1789—A. Barclay.
Pumps, construction of—1860—J. H. Beattie.
Railway carriages, construction of—1754—J. S. Tucker.
Railway carriages, obtaining communication from one to another—1837—W. S. Lawson.
Railway signals—1858—J. Lang.
Railway tracks, working of moving parts of—1873—W. Anderson.
Railways, permanent way of—1617—W. E. Gedge.
Rivet-making machines—1829—F. Peskett.
Safety valves—1847—J. H. Johnson.
Sails, reefing, &c.—1806—O. Phalp.
Sails, reefing fore and aft—1817—J. Hart.
Salt, manufacture of—1833—D. Hall and A. L. Roosen.
Sewing machinery—1822—N. Salamon.
Ships, &c., armour for—1778—J. Chalmers.
Ships, &c., constructing and propelling—1836—A. F. Osler.
Ships, construction of—1866—M. Scott.
Ships, raising sunken or stranded—1871—J. A. P. MacBride.
Ships, screw propellers for—1818—R. Lees.
Silicium, fluoride of—1766—R. A. Brooman.
Slate, marble, &c., apparatus for cutting—1838—J. Clark.
Smoke-burning furnaces—1798—F. C. Cosserat.
Smoky chimneys, apparatus for curing—1704—S. Freeman.
Spindles, attaching knobs to—1826—J. and J. L. Hinks.
Steam boilers, feed apparatus for—1857—H. A. Bonneville.

From Commissioners of Patents Journal, August 9th.

Patents Sealed.

326. T. Snowdon.	376. W. Riddle.
334. V. de Stains and T. Rogers.	379. J. Redford.
336. J. Smith.	382. W. Whiteley.
338. W. C. Stobart.	389. G. Bohn.
346. P. Spence.	395. W. C. Fuller.
357. J. M. Faget.	428. R. S. Symington.
361. A. and E. M. Denny.	480. C. Hull.
368. T. White.	497. F. Weil.
369. J. Henderson, S. C. Child, and W. L. Duncan.	615. W. R. Bowditch.
370. W. Winstanley & J. Kelly.	978. G. T. Bousfield.
371. W. E. Gedge.	1214. G. T. Bousfield.
372. W. Drake.	1287. J. L. and J. Hinks.
375. F. W. Burton.	1290. G. T. Bousfield.
	1429. A. V. Newton.

Patents on which the Stamp Duty of £50 has been Paid.

1914. E. J. Muygridge.	1947. M. A. F. Mennons.
1922. W. E. Newton.	1948. W. and J. Galloway and J. W. Wilson.
1931. J. Henderson & J. Broadley.	1969. N. D. P. Maillard.
1936. J. Lewis.	1976. A. V. Newton.
1956. W. Clark.	1977. A. V. Newton.
1994. H. Wilde.	1987. A. V. Newton.
1975. G. H. Bovill.	
2109. W. D. Player.	

Patents on which the Stamp Duty of £100 has been Paid.

2182. P. Carmichael.	2183. R. Hoe.

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TABLE OF CONTENTS.

Announcements by the Council.

EXAMINATIONS, 1865.

The Programme of Examinations for 1865 is now ready, and may be had gratis on application to the Secretary. A copy has been sent to each Institution and Local Board.

Proceedings of the Society.

CANTOR LECTURES.

"ON CHEMISTRY APPLIED TO THE ARTS." BY DR. F. CRACE CALVERT, F.R.S., F.C.S.

LECTURE V.*

DELIVERED ON THURSDAY EVENING, MAY 5, 1864.

BILE, its properties. *Blood*, its composition, and application in the refining of sugar and manufacture of albumen. *Albumen*, its application to calico-printing and photography. *Milk*, its composition, properties, falsification, and preservation. *Urine*, its uses. A few words on putrefaction.

In this lecture we shall examine the composition of the various liquids secreted in the human body and in those of animals, and the uses to which these fluids are applied in arts and manufactures.

Bile.—The composition and appearance of bile vary greatly in different animals. Usually it is a yellow, green, or brown, thick fluid, with a marked alkaline reaction, and containing about 14 per cent. of solid matter, the most important constituents of which are, in human bile, mucus, two colouring matters, one yellow, (*cholepyrrhine*) the other green (*biliverdine*), sugar, albumen, two organic acids (*cholic and choleic*), combined with soda, oleate and margarate of soda, a non-saponifiable fatty matter (*cholesterine*), and several mineral salts. The two most interesting substances in bile are choleic acid and cholestérine, which, when produced in undue proportion, give rise to those calculi, the passage of which through the biliary duct is so dangerous and painful. One of the most valuable papers published of late is that of Mr. G. Kemp, in the Transactions of the Royal Society, on the conversion of the hepatic bile into cestic,—thus he has shown that as the former is secreted by the liver, and arrives by the biliary duct in the gall bladder, it is there converted into cestic bile by means of a special fermentation, induced by a mucus secreted in the walls of the gall bladder. It is believed by most physiologists that the principal function of bile is to neutralize the acid fluids resulting from digestion in the stomach, as they enter the small intestines, rendering them better adapted for their sojourn there, and also facilitating their fermentation, one of the most important phenomena of digestion. The employment of bile as a scouring agent has much diminished of late years, owing to the substitution for it of benzine and Sherwood spirit.

Blood.—The study of this all-important fluid is most interesting, in a physiological point of view, for the 27 pounds of blood (the average amount in an adult) which travels through the whole of the human frame in about three minutes, fulfils three distinct functions, viz.,—it carries the various elements of food, as modified by digestion, into the different parts of the body requiring them; it helps to remove from the system those substances which have fulfilled their required functions in it, and which have been rendered useless by the wear and tear of life; and it conveys through the system the heat generated by the oxidation, through respiration, of the substances which have been absorbed during digestion, as well as of those which have performed their part in the human economy, and require to be removed therefrom. It will, therefore, be easily understood that blood must be a complicated fluid; and the following table will give an idea of the truth of this assertion:—

1,000 parts of Blood.

130·85 of clot	Fibrine	2·95	130·85
	Globules	125·63	
	Hematosine	2·27	
869·15 of serum.	Water	790·37	869·15
	Albumen, Soda	67·80	
	Phosphate of Soda	10·98	
	Lactate of do.		
	Carbonate of do.		
	Chloride of Sodium		
	,, of Potassium		
	Carbonate of Lime		
	,, of Magnesia		
	Ammoniacal Salts		
	Phosphate of Lime		
	,, of Magnesia		
	Sulphate of Potash		
	Fatty Acids, free or combined		
	Cholesterine		
	Lecithine (phosphurretted fat)		
	Ceribrine, or nitrogenated fat		
1000·00			1000·00

* This lecture was No. VI. when the Course was delivered, but the present order of publication has been adopted, as bringing the whole subject more systematically before the reader.

It will facilitate our study of this complicated fluid if we class the various compounds existing in it under six different heads. Firstly, if blood, immediately after being drawn from an animal, is whipped with a birch-rod, the ends of the twigs will have hanging from them a stringy mass, which, after being well washed, is grey and elastic, and is called *fibrine*. Secondly, if the blood so treated is mixed with a solution of sulphate of soda of sp. gr. 1·16, and the whole thrown on a filter, the *corpuscules* and the colouring matter called *hematosine*, will remain on the filter, and these substances, with the fibrine, form, as shown in the table, the clot of blood. Further, if the matter left on the filter is treated with concentrated acetic acid, the colouring matter is dissolved and the corpuscules are left as yellow discs. Thirdly, on boiling the fluid which passes through the filter, albumen is coagulated and can be easily separated, leaving water and a few saline substances, which are easily separated by evaporating the liquid portion. Allow me now to add a few remarks on some of the substances above mentioned. Fibrine represents the fibrous or muscular part of animals, but has no direct application in manufactures. The blood corpuscules in man are ellipsoid discs, containing the colouring matter of blood. The most interesting fact connected with the latter is that it is united with a compound containing iron; and although iron does not appear to be an integral part of the colour, still its presence appears essential to the existence of the colour itself. The external part of the discs is composed of fibrine, whilst the interior contains an albuminous fluid (which differs from the albumen of the serum in the fact that it is not coagulated by heat) and which is called globuline. The relative proportions of fibrine, globuline, and hematosine, vary considerably in different individuals, according to health, age, and sex, and even during the process of digestion. When blood is examined under the microscope, large colourless globules are found to float with those just described. Dr. William Roberts, of Manchester, who has examined the corpuscules of blood, has observed that when they are dipped into a solution of magenta, they assume not only a pink colour, but that the nucleus of the disc acquires a much deeper shade. Further, that on the sides of the disc there are small projections which he calls pullulations, and which acquire a much deeper tint than the remainder of the discs when plunged into the magenta solution. Another curious fact lately observed by M. Pasteur is that if blood is kept for several weeks in a cold situation, air being excluded, the corpuscules disappear, and are replaced by myriads of beautiful red well-defined crystals. Lastly, there is a slight difference of composition between arterial and venous blood.

	Arterial.	Venous.
Carbon	50·2	55·7
Nitrogen	16·3	16·2
Hydrogen	6·6	6·4
Oxygen	26·3	21·7
	99·4	100·0

It is strange that while blood is so extensively employed on the Continent in various branches of manufacture that in Paris 2,000 tons of blood are used by sugar refiners alone, hardly any such application of this fluid is made in our own country. It appears to me that the explanation is to be found in the fact that on the Continent beasts are generally slaughtered in public abattoirs, by which means many of the refuse matters can be collected with advantage, and without being spoilt or polluted by unscrupulous persons, whilst in this country, where animals are slaughtered in innumerable private slaughter-houses, the difficulty and expense of collection, together with the absence of guarantee of quality, render the successful use of blood on a large scale impracticable. There is an additional advantage in the system of public abattoirs, which I cannot help noticing *en passant*, viz., the guarantee thereby obtained that the public food is not furnished from diseased animals. The only employment of blood in its integrity in this country is as an article of diet, and to some extent in the manufacture of prussiate of potash. The serum of blood is sometimes used in England, as well as on the Continent, as one of the substances essential in the process followed to communicate to cotton the magnificent colour called "Turkey red."

Albumen (blood).—The employment of this substance in the art of calico printing is of comparatively recent date, as it is chiefly due to the introduction of the tar colours and pigment styles into that art. To fix colours with this albumen (or that of egg) it is only necessary to dissolve in a gallon of water several pounds of albumen and gum Senegal, adding a little tar colour, such as magenta, &c., or a pigment, such as ultramarine blue, these mixtures are then printed on the cotton fabric, and the colour fixed by the coagulation of the albumen under the influence of high pressure steam. But the quantity of albumen used for this purpose has greatly decreased of late years, owing to the introduction of tannin by Mr. Charles Lowe and myself, Messrs. Roberts, Dale, and Co., and Mr. Gratrix, and also that of the arseniate of alumina by Mr. W. A. Perkin. The substitution of blood albumen for that of egg is chiefly due to Messrs. Rohart, Roger, and Co., who, I believe, prepare it by separating carefully the serum of blood from the clot, adding to it a small quantity of alum to separate any colouring matter that may be mixed with it, and evaporating the water of the serum by a current of air heated to 100°, which leaves the albumen in the form of yellowish scales, freely soluble when placed again in contact with water. The most abundant source of albumen, however, is the white of egg, and therefore let us glance at a few facts connected with this substance, doubly important as an article of manufacture, and as one of food. To give some idea of the extensive use of eggs, I may state that in Paris there are annually consumed 178,000 000 eggs, weighing 28,000,000 pounds. The composition of a hen's egg may be stated to be as follows:—

Shell	11·5
White	58·5
Yolk	30·0
	100·0

The following are the respective compositions of the yolk and white:—

Yolk.	
Water	51·47
Vitelline	15·76
Oleine, Margarine, Cholesterine	28·97
Phospho-glyceric acid	1·26
Colouring matters	1·20
Mineral salts	1.34
	100·00

White.	
Water	86.34
Albumen	12·50
Membrane	0·50
Phosphates, Chlorides, &c.	0·66
	100·00

An egg may be considered as consisting of four parts, the shell, membrane, white, and yolk. The shell is composed of carbonates of lime and magnesia, phosphate of lime, and oxide of iron, the whole bound together by a nitro-sulphuretted substance. The presence of sulphur in this substance, as well as in albumen, explains why eggs give off sulphuretted hydrogen when boiled. The membrane lining the shell is also a nitrosulphuretted substance, much resembling in its composition that of horn. I have already had occasion to speak of the interesting composition of the yolk of egg, when mentioning its application in the glove manufacture, and on that occasion I drew your attention to the remarkable substance called vitelline, and to the peculiar nature of the fats contained in yolk of eggs, but more especially the phospho-glyceric acid, attributing to them the peculiar properties imparted to leather through their use. The white of egg chiefly consists, as the above table shows, of a substance called

albumen, which you will remember is also found in blood, and, I may add, that it exists in the sap of all plants. Albumen is a fluid of an alkaline reaction, soluble in water; and cogulates at 160° when undiluted, but when dissolved in water the temperature at which it coagulates is raised according to the extent of its dilution. Albumen gives a precipitate with all metallic salts, but one of the most characteristic and delicate tests for albumen in solution, is bichloride of mercury or corrosive sublimate. In fact, albumen is the best antidote known to the action of this violent poison, when taken internally, as was proved by its saving the life of a most eminent chemist (Baron Thenard) in 1825. All acids, except phosphoric and acetic, precipitate albumen from its solutions, but that which separates it with the greatest nicety is nitric acid. When placed in contact with hydrochloric acid for a few hours, it assumes a very beautiful purple colour. When albumen is placed in shallow vessels, and then stored in a chamber where air at 100° is allowed to circulate, the water evaporates and leaves the solid albumen in the form of yellowish semi-transparent scales, which, strange to say, will, if kept dry, resist putrefaction for any length of time, although in its liquid form the large amount of nitrogen it contains renders it highly putrescible. It is this solid albumen which is used by calico printers, as it is easily dissolved in water and rendered applicable to their purposes. Albumen is often used in manufactures to clarify fluids. In some instances the albumen in solution is added to the fluid and carried to the boil, when the dissolved albumen coagulates, and in falling through the fluid carries with it mechanically the matters in suspension, when it is only necessary to decant the clarified fluid. In others it is added at natural temperature, as in the case of wines, where the tannin, alcohol, and acids are the agents which coagulate the albumen. Albumen was first applied to photography by Niepce de St. Victor, in the following form: he mixed together intimately 10 fluid ounces of distilled water with the white of 10 fresh eggs; to this he added 200 grains of chloride of sodium or chloride of ammonium. The whole was well shaken in a bottle for about ten minutes, and then allowed to stand. All that was then required was to decant the clear liquor, and apply it to the surfaces intended to receive the photographic image. [Here the lecturer shortly described this photographic process, and alluded to the recent application of the light resulting from the combustion of magnesium wire, manufactured by Messrs. J. Mellor and Co., of Salford, showing its applicability to photography, by using this light to take photographs during the lecture, stating that the cost was only a few pence.] A great many attempts have been made to preserve eggs from decay, the most successful of which have been those of La Maison Cormier du Mans, who covers the egg with an impermeable varnish, packing them in sawdust, so that the egg shall always rest on one end. Another process is that of immersing the eggs in limewater. Lastly, the whole of the egg has been emptied out of the shell and evaporated to a solid mass. I must not conclude the subject of the albuminous and vitelline substances without calling your attention to the following table, which will give an idea of the different albumens and vitellines which Mr. E. Fremy has succeeded in isolating and characterising:—

EGGS OF BIRDS.

Albumen	coagulated by heat	All these substances are characterised by containing sulphur.
Eudophacine	" "	
Albumen	" acid	
Meta albumen	" neither	
Exophacine	" "	

EGGS OF FISHES.

Ray	Ichthine	All these substances are characterised by containing phosphorus.
Goldfish, Carp	Ichthidine	
Salmon	Ichthuline and Salmonic acid.	
Turtle	Eurydine.	

Milk.—The composition of this important fluid varies not only in different classes of animals, but also in different individuals of the same class. Further, the composition of milk is modified by the influence of food, climate, degree of activity, and health. Notwithstanding these variations an average can be arrived at by numerous analyses, and the following table will give a general idea of milk:—

	Woman's.	Cows'.	Asses'.	Goats'.	Ewes'.
Dried Caseine...	15·2	44·8	18·2	40·2	45·8
Butter	33·5	31·3	1·1	33·2	12·0
Sugar of Milk...	65 0	47·7	60·8	52·8	50·0
Salts	4·5	6·0	3·4	5·8	6·8
Water	881·8	870·2	916·5	868·0	885·4
	1000·0	1000·0	1000·0	1000·0	1000·0

The various substances comprised in milk may be classified under three heads—cream, curd or caseine, and whey.

Cream, according to Dr. Voelcker's* analysis, is composed of:—

Water	61·67	64·80
Butter	33·43	25·40
Caseine	2·62	7·61
Sugar of milk	1·56	
Mineral matters	0·72	2·19
	100·00	100·00

And may be considered as consisting of small, round, egg-shaped globules, composed of fatty matters, enclosed in a thin cell of caseine, which, being lighter than the fluid containing them, rise to the surface and constitute cream, and in proportion to the quantity of this removed from the milk, the latter becomes less opaque, and assumes a blue tinge. When exposed to the air for a short time in a dry place it loses water, becomes more compact, and constitutes what is called cream cheese. When churned, cream undergoes a complete change; the caseine cells are broken, and the fatty globules gradually adhere one to the other and form a solid fatty mass, called butter, and it is found, on an average, that 28lbs. of milk will yield one pound of butter. Fresh butter is composed of:—

Fatty matters...	Margarine, Oleine, Caproine, Caprine, Butyrine, Caproleine,	77·5
Caseine		1·6
Whey		20·9
		100·0

But as butter rapidly becomes rancid, it is necessary to adopt means to prevent this as much as possible, and the following are the usual methods, viz.—working the butter well with water, and then adding 3 or 4 per cent. of common salt, or, melting the butter at a temperature below 212°; but the following method, employed by M. Bréon, appears to give general satisfaction. It consists in adding to the butter, water containing 0·003 of acetic or tartaric acid, and carefully closing the vessels containing it. The rancidity of butter is due to a fermentation generated by the caseine existing in it, which unfolds the fatty matters into their respective acids and glycerine, and as the volatile acids, butyric, caproic, &c., have a most disagreeable taste and odour, it is these which impart to butter the rank taste. Allow me to add,

* For further particulars on this subject the reader is referred Dr. Voelcker's paper, published in the *Journal of the Royal Agricultural Society of England*, volume 24.

en passant, that whilst butyric acid possesses a repulsive smell, its ether has a most flagrant odour, viz., that of pine-apple, for which it is sold in commerce.

Curd of Milk or Caseine has, according to Dr. Voelcker, the following composition:—

Carbon	53·57
Hydrogen	7·14
Nitrogen	15·41
Oxygen	22 03
Sulphur	1·11
Phosphorus	0·74
Total	100·00

And is easily recognisable by its white flocculent appearance. It is insipid and inodorous, like albumen, from which it differs in its insolubility in water, though it is dissolved by a weak solution of alkali or acid. But what chiefly distinguishes caseine is that it is not coagulated on boiling, and that rennet precipitates it from its solutions. Dr. Voelcker has proved, however, in his researches on cheese, that the commonly-received opinion, that rennet coagulates milk by decomposing the lactine into lactic acid, is incorrect, for he has coagulated milk while in an alkaline condition, and it is owing to the difference in the action of rennet on albumen and caseine, that chemists have been able to detect the presence of $\frac{1}{2}$ to $\frac{3}{4}$ per cent. of albumen in milk. This important organic substance not only exists in milk, but is also found in small quantities in the blood o some animals, such as the ox, and in a large class of plants, but more especially in the leguminous tribe, such as peas, beans, &c. Caseine is the basis of all cheeses, and when these are made with milk from which the cream has been previously taken, the cheese is dry, but when part of the cream has been left the cheese is rich in fatty matters as well as in caseine; and I may add that the peculiar flavours characterising different cheeses are caused by modifying the conditions of the fermentations which the organic matters undergo. The following researches made by M. Blondeau illustrate this point, as well as the modifications which cryptogamic life under peculiar circumstances may effect in the composition of organic substances, and his interesting results were obtained in studying the conversion of curd into the well-known cheese of Roquefort. He placed in a cellar some curd of the following composition:—

Caseine	85·43
Fatty matters	1·85
Lactic acid	0·88
Water	11·84
	100·00

to which he added a small quantity of salt. After a month, and again after two months, he analysed portions of the same, with the following results:—

	After 1 month.	After 2 months.
Caseine	61·33	43·28
Fatty matters	16·12	32·31
Chloride of Sodium	4·40	4·45
Water	18·15	19·16
Butyric acid	....	0·67
	100·00	99·87

The above figures show a most extraordinary change in the caseine or curd, for we observe that the proportion of caseine gradually decreases, and is replaced by fatty matters. Considering the circumstances under which this phenomenon has occurred, there can be no doubt that this curious conversion of an animal matter into a fatty one is due to a cryptogamic vegetation or ferment; and if the Roquefort cheese be exposed to the air under a bell jar for 12 months, the decomposition becomes still more complete; for it is no longer the caseine which undergoes a transformation, but the oleine of the fatty matters. The following analyses clearly illustrate this curious action. Composition of the cheese after 2 and 12 months:—

	After 2 months.	After 12 months.
Caseine	43·28	40·23
Margarine	18·30	16·85
Oleine	14·00	1·48
Butyric acid	0·67	....
Common salt	4·45	4·45
Water	19·30	15·16
Butyrate of ammonia	....	5·62
Caproate of ammonia	....	7·31
Caprylate of ammonia	....	4·18
Caprate of ammonia	....	4·21
	100·00	99·49

The substances to which cheeses owe their peculiar flavour are ammoniacal salts, chiefly composed of various organic acids, such as acetic, butyric, capric, caproic, and caproleic. I cannot better conclude my remarks on cheese than by extracting from Dr. Voelcker's interesting papers a few of his numerous analyses of different kinds of cheese:—

	Cheshire.	Stilton.	Old Cheddar.	Double Gloster.	Single Gloster.	American
Water	32·59	20·27	30·32	32·44	28·10	27·29
Butter	32·51	43·98	35·53	30·17	33·68	35·41
†Caseine	26·06		28·18	31·75	30·31	25·87
Sugar of milk / Lactic acid	4·53	33·55	1·66	1·22	3·72	6·21
†Mineral matter	4·31	2·20	4·31	4·42	4·19	5·22
	100·00	100·00	100·00	100·00	100·00	100·00
†Nitrogen	4·17	3·89	4·51	5·12	4·85	4·14
†Common salt	1·59	0·29	1·55	1·41	1·12	1·97

The principal application of caseine in arts and manufactures is that first introduced by Mr. R. T. Pattison, who used it under the name of lactarine for fixing pigments in calico printing. His process consists in drying the washed curds of milk, which he sells to the calico printer, who mixes it with a solution of ammonia or weak alkali which swells it out and renders it soluble in water. To a solution of this substance, of proper consistency, he adds one of the tar colours, prints it, submits the goods to the action of steam, which drives off the ammonia, leaving fixed on the fabric the caseine and colour. In consequence of the insoluble compound which caseine forms with lime it has often been used as a substitute for glue or linseed oil in house painting, and it may be useful to some of my audience to know that when caseine is dissolved in a concentrated solution of borax, an adhesive fluid is formed, which is capable in many cases of serving the purposes of glue or starch. Mr. Wagner has made another useful application of caseine, mixing it with 6 parts of calcined magnesia and one part of oxide of zinc, and a sufficient quantity of water to make a pasty mass, which he leaves to solidify, and when dry it is extremely hard, susceptible of receiving a high polish, and is sold as a substitute for meerschaum.

Whey.—According to Dr. Voelcker, the composition of whey is as follows:—

Water	89·65
Butter	0·79
Caseine	3·01
Sugar of Milk	5·72
Mineral Matters	0·83
	100·00

When whey is concentrated to the state of syrup, and kept in a cold place, it gradually deposits fine well-defined crystals, which, on further purification and re-crystallisation, yield white quadrangular prisms of a substance, called lactine, or sugar of milk, which is highly interest-

ing. It is remarkable that while sugar of milk has only been known in Europe for a comparatively short period, where homœopathists are its principal employers, in India lactine has been known for a great number of years. Let us now study some of the chemical facts connected with sugar of milk. Thus cane sugar, when acted upon by nitric acid, gives oxalic acid, whilst lactine gives mucic acid; cane sugar, when unfolded under the influence of a ferment, gives alcohol and carbonic acid; lactine yields lactic acid. As the latter transformation is most important, in a physiological and chemical point of view, allow me to dwell upon it for a few minutes. The substance which possesses the property of most readily converting lactine into lactic acid, is caseine after it has undergone some peculiar modification, which renders it a ferment. Thus when milk leaves the cow it is alkaline, but when exposed to the air it rapidly becomes acid, and this is due to the conversion of lactine into lactic acid, a change most interesting as a chemical fact, since both lactine and lactic acid have the same composition, the only difference being that two equivalents of oxygen and two of hydrogen cease to exist as such in the acid, but may be considered as combined in the form of water with the remaining elements—

Lactine .... C_{12} H_{12} O_{12}
2 Lactic acid...... (C_6 H_5 O_5 HO)

M. Pasteur has shown that this lactic fermentation is not merely confined to milk, but that it is a peculiar fermentation, differing from the previous one, which frequently occurs during the decomposition of organic matters, and is due to a distinct ferment of its own; and his researches on lactic fermentation have explained the fact, observed by M. Pelouze, some years since, that when a vegetable substance, such as sugar or starch, was put in contact with chalk or other alkali and an animal substance, lactic fermentation ensued, but until the researches of M. Pasteur, we did not know why sugar and starch, in these circumstances, should give lactic acid instead of alcohol and carbonic acid, which would be the result of a fermentation produced by yeast. Lactic acid is a most interesting substance to the physiologist, for it is found in large quantities, free or combined with lime, in gastric juice, in the muscular part of animals, or with soda, in blood, and its production is easily accounted for when we remember that it can be produced from the starch and sugar existing in our food. When lactic acid is purified by various chemical means and separated from the fluid in which it is combined, it presents itself as a syrupy fluid, of an intensely acid reaction, which, when submitted to the action of heat, first loses its one equivalent of water, and becomes anhydrous lactic acid, and on a further application of heat loses still one equivalent of water, and is transformed into a neutral substance called lactide. This acid, in a free state, has not yet received any important application in arts and manufactures, but I have little doubt that it will some day be largely employed, for we have noticed in a former lecture its advantageous use when produced from rye and other amylaceous substances in removing the lime from various skins intended to be tanned or prepared as there described, and Mr. E. Hunt has used it in the form of sour milk for the conversion of starch into dextrine (see *Journal of the Society of Arts*, December 23rd, 1859). I wish now to say a few words on the mineral substances existing in whey, and which play a most important part in milk as a nutritious substance. We are all of us too apt to overlook the importance of the mineral elements in food, and to consider as essential the organic matters only. In milk, however, its alkaline salts, and especially the phosphate of lime, are as essential (as food) as caseine or fatty matters, for if an infant requires the lactine to maintain respiration and the heat of the body, the caseine to contribute to the formation of blood, the phosphate of lime is equally essential to the production of bone; permit me here to state that the practice adopted by some mothers of feeding infants upon amylaceous substances, such as arrowroot, sago, tapioca, &c., in place of milk, is most pernicious, for these contain neither flesh nor bone forming element, and milk is the only proper food for infants.

Having now examined the general properties of some of the most important constituents of milk, let us say a few words on that fluid in its integrity. We all know how rapidly milk becomes sour, especially at a temperature of 70° to 90°, and as this is owing, as already explained, to the formation of lactic acid, the best way to preserve milk sweet for domestic purposes is to add to it every day a few grains per pint of carbonate of soda, to keep the milk alkaline. The possibility of preserving milk for a lengthened period has repeatedly occupied the attention of scientific men, as a most important problem to solve for the benefit of persons undergoing long sea-voyages, but up to a recent date with very imperfect success. One of the best plans proposed is to add to milk seven or eight per cent. of sugar, and evaporate the whole, agitating all the time to prevent the formation of the skin, and when reduced to one-fifth of its bulk to introduce it into tin cans, which, after being subjected for half an hour to a temperature of 220°, are hermetically sealed. In 1855, l'Abbé Moigno drew the attention of the members of the British Association at Glasgow to milk, which he stated contained nothing injurious, and which would keep for a long period. This statement has proved correct, for I have here some milk which has been in the hands of the secretary of this Society since that period, and which, on being opened to day, was found perfectly sweet. But if l'Abbé Moigno's process has remained a secret, M. Pasteur has succeeded in effecting the same end, and probably by the same method. Thus he has found that if milk be heated to 212° it will only remain sweet for a few days, if heated to 220° it will remain sweet for several weeks, but if to 250° (under pressure, of course) the milk will keep for any length of time. This, according to M. Pasteur, is owing to the spores or eggs which generate lactic fermentation being destroyed by the high temperature, and thus the possibility of fermentation is put an end to. The adulteration of milk by various substances stated to have been discovered therein, has, I think, been greatly overestimated, as I have never found any of them in the samples of milk which I have analysed, in fact the most easy and cheapest of all is the addition of water. It is comparatively easy to ascertain if milk has been tampered with; but, without entering into details of the methods necessary to estimate the exact extent of adulteration, I may mention the following plan:—If a glass tube, divided into 100 equal parts, is filled with milk and left standing for twenty-four hours, the cream will rise to the upper part of the tube, and, if the milk is genuine, will occupy from 11 to 13 divisions. Another practical method is to add to the milk a little caustic soda, and agitate the whole with a little ether and alcohol, which dissolves the fatty matters; this ethereal solution is removed from the milk and evaporated, when the fatty matters remain, and experience has shown that 1,000 parts of good milk will yield 37 parts of fatty matters. Any milk leaving no more than 27 must have been tampered with. Dr. Voelcker suggests the employment of a hydrometer as a means of ascertaining the quality of milk, as the specific gravity of that fluid is an excellent test. From a great number of experiments he has ascertained that good new milk has a sp. gr. of 1·030, whilst if good milk is adulterated with 20 per cent. of water, its sp. gr. will fall to 1·025.

Urine is a fluid secreted by the kidneys, which organs separate from the blood as it circulates through them any excess of water it may contain, as well as many organic substances which have fulfilled their vital function in the animal economy, and which require to be removed from the system. The composition of urine varies greatly in different individuals, and in the same individual at different times, and is influenced by diet, exercise, state of

health, &c., as shown by Dr. Bence Jones and Dr. Edward Smith, but without detailing these variations, which would occupy far more time than the limits of a lecture would permit, allow me to call your attention to the following table, showing the composition of human and herbivorous animals' urine :—

HUMAN.

Water	933·000
Urea	30·100
Lactic acid; Lactate of ammonia; Extractive matter; Kreatine; Kreatinine; Hippuric acid; Indican; Colloid acid (W. Marcet)	17·140
Uric acid	1·000
Naecus	0·320
Mineral salts	18·440
	1000·000

HORSES.

Water	910·76
Urea	31·00
Hippurate of potash	4·74
Lactate of do.	11·28
Do. of soda	8·81
Bicarbonate of potash	15·50
Carbonate of lime	10·82
Carbonate of magnesia	4·16
Other salts	2·93
	1000·00

The substances in human urine which call for special notice are urea and uric acid; in herbivorous animals, hippuric acid; and in birds, uric acid.

Urea is a substance crystallizing in various derivative forms belonging to the prismatic system—it is very soluble in water and alcohol, and gives beautiful and well defined salts with nitric and oxalic acids. Urea, under the influence of a mucous substance secreted at the same time, and which is easily modified into a ferment, is rapidly converted, by the fixation of two atoms of water, into carbonate of ammonia, as seen by this formula :—

Urea	C_2	O_2	N_2	H_4
Water		O_2		H_2
Carbonate of Ammonia	C_2	O_4	N_2	H_6

This will explain the strong ammoniacal odour arising from urine after being kept for a short time; and as it may be most important for medical men to be able to preserve urine in its normal condition for several days, I observed a few years since a most effectual method of preserving it, which is merely the addition of a few drops of carbolic acid immediately after the production of the urine. Urea is peculiarly interesting to chemists, as it was the first organic substance which they succeeded in producing artificially from mineral compounds. This interesting discovery was made by Wöhler, in 1820, in acting upon cyanate of silver by hydrochlorate of ammonia. Since then Baron Liebig has devised a more simple process, which consists in decomposing cyanate of potash by sulphate of ammonia, which gives rise to sulphate of potash and cyanate of ammonia or urea. The average quantity of urea rejected daily by an adult man is about an ounce, or 2½ per cent. of the fluid itself. Although human urine does not contain more than 1 per cent. of uric acid, and this generally combined with soda, still I deem it my duty to say a few words respecting it, for it is often the principal source of gravel and calculus, owing to various influences which make the urine strongly acid before its rejection, whereby the soda is neutralized, the uric acid liberated, and this being nearly insoluble, separates, and has a tendency to form gravel or calculus. In fact, the deposit which occurs in this fluid is generally represented by uric acid, phosphate of lime, and magnesia, mucus, and colouring matter. It may be here stated that calculi were formerly held in great estimation, especially those formed in the intestine, and called bezoards, and this was the case in Eastern counties until very recently. Thus it is related that a Shah of Persia sent to Napoleon the the First, among other valuable presents, three bezoards, which were considered to be of great antiquity, and capable of curing all diseases. The urine of birds and reptiles being almost entirely composed of urate of lime, explains why their refuse is of such value as a manure, which arises from its transformation into carbonate of ammonia. When large masses of this refuse undergo a slow and gradual decomposition, as in the dry climate of the Pacific Islands, on the coasts of Peru and Chili, it constitutes guano. It may be interesting to know that in 1855, 6, and 7, a most beautiful colour was prepared from the uric acid contained in guano, and used largely by calico printers and silk dyers under the name of Roman purple, or murexide.*

Before leaving the study of this important animal secretion, let me say a few words on the urine of herbivorous animals. It is generally alkaline, and contains, besides an aromatic principle, an acid discovered by Liebig, and called hippuric acid, together with urea and uric acid, also found in human urine. Hippuric acid is easily obtained in the form of well-defined crystals, by rapidly evaporating the fluid containing it. This acid does not exist in the food of the animal; but benzoic acid, or its homologues are found there, and during the phenomena of digestion the nitrogenated principles produced by the wear and tear of life, fix themselves on the benzoic acid, and convert it into hippuric, as seen by this formula :—

$$\underset{\text{Benzoic Acid.}}{C_{14}H_5O_3 + HO} \ \ldots\ldots \ \underset{\text{Hippuric Acid.}}{C_{18}H_8O_5N_2 + HO.}$$

A further proof of the correctness of this view is that when hippuric acid is treated with strong acids or alkali, it transforms itself into benzoic acid, which can be easily extracted.

PATENT LAWS.

The following letter, from Mr. Edmund Pontifex, recently addressed to the editor of the *Times*, with the reply in a leader from that journal, contain in a convenient form the principal arguments on each side of this question :—

"In your Saturday's article on Lord Stanley's speech you object to the conclusions he appears to have arrived at with regard to the Patent Laws, and assert that the true way of dealing with the inventor is to let him reward himself; that if the Patent Laws were abolished tomorrow he would still have his priority, his secret; that if he can keep his secret he may derive from it what advantage he can, but that, if publication be a necessary consequence of its use, the public should not be called upon to pay for what is in its nature incapable of appropriation.

"It is difficult to see in what respect the publication of a new or improved process of manufacture renders it more 'incapable of appropriation' than the publication of ideas in the form of a book. Patent right corresponds to copyright. One protects the development of thought in words, the other in that of facts, and being the more practical, it has, perhaps, the better claim of the two. Indeed, the present Patent Laws admit this principle, for they deny that protection to abstract ideas which they afford them when reduced to a practical application.

"If, then, protection is denied to the inventor, how can it be claimed for the author? The artist and designer

* See, for further details, the paper read by Dr. Calvert before the Society, February 5th, 1862.—*Journal*, vol. x., p. 169.

also stand on the same footing as the inventor, and it would scarcely be sugges'ed so greatly to discourage art as to abolish the copyright in pictures and designs.

"The Patent Laws are no doubt capable of much improvement. If it were practicable it would undoubtedly be a great advantage for a tribunal of experts to decide whether or not suggested inventions or improvements were sufficiently novel and useful to be worthy of protection, as also the term of protection their merit and importance deserved; but I confidently believe that it is essential to the continued progress of the manufacturing industry of this country that inventors should enjoy some protection for their inventions, and without it we should infallibly lose much of our pre-eminence as a manufacturing nation."

"How is the inventor to 'reward himself?' The public would not pay him a fraction more whether he be the inventor or not, for the same thing that they can buy equally cheap elsewhere. Even if it were possible to keep any branch of manufacture secret when rivals have sufficient inducement to discover it, it is not to the advantage of the public that improvements should be concealed. Take the recent case of Mr. Perkins's discovery in aniline colours, which is of a nature that probably might have been kept secret with comparative ease. The publication of his process turned the attention of experimenters into the same direction, and kindred colours have since and in consequence been discovered by Medlock and others.

"Admitting fully that monopolies should only be given to an individual in the interests of the public, it is to their best interests that the inventor should be protected. The proper duration of that protection is a fair subject for discussion. It may be useful to vary it in different cases, but the object to be kept in view should be to offer such present advantages as will encourage the prosecution of experiments leading to discoveries, without afterwards granting a monopoly for so long a term as to cause an inconvenience to the public disproportionate to the good it has derived.

"A great deal is said of the selfishness of the ideal discoverer who, happening upon some improvement, churlishly exacts exorbitant toll for the use of it, or else insists upon burying his talent, and not being able himself to make it useful refuses to allow others to profit by it. Practically, discoveries are not made in this way. Trees of knowledge do not grow by the wayside, from which passers-by can gather fruit without an effort; and when a man has made a discovery, he is not likely to refuse a fair price for it. If he asks a high one and obtains it, his discovery must be worth the price, and therefore ought to have it. At the worst the nation is debarred for 14 years—not a long period in the life of a nation—from the use of that which otherwise would probably never have been communicated to it at all.

"It is said that inventors are of such a gushing nature, that without any such protection they would not refrain from communicating their discoveries to the world. Possibly this might be so when the discovery had been accomplished, and especially it may be true of essentially scientific discoveries, but I submit that the absence of the prospect of protection would most materially discourage that long course of laborious, minute, and persevering inquiry which forms the germ out of which—perhaps long after, and in other hands—flashes some brilliant development. The great discoverer is indebted, no one can say how far, to the humble, patient inquirers who have preceded him; they have sought the same end, though they may not have achieved the same success. He, perhaps, can afford to be content with his glory, but it was the hope of profit that prompted their labours and prepared the way for his brilliant discovery. Discourage them, and you cut away the foundation upon which he builds. All who have had experience in manufactures know the great amount of labour and perseverance necessary to make even the most trivial improvements; the endless experiments, disappointments, failures, and expense which precede success, and are too often never rewarded by it. Who would incur all this if he is to possess no property in the result should he have the good fortune to obtain a valuable one? And observe, he would not even be placed on the same footing as others; he would be at a great and positive disadvantage. He would have consumed time and money in elaborating his ideas; in other words, he would have expended capital upon which he ought to receive interest; his neighbours and rivals in pirating his invention could undersell him in it through having avoided any such outlay. Thus the original inventor would be more disadvantageously situated than any one else. Who then would be so foolish as to invent? It would be a temptation to manufacturers to make no exertions on their own parts, but to content themselves with pirating what others were doing.

"It is all very well to talk of manufacturers striving to improve for the love of the thing, and no doubt they take a proper pride in excelling in their several departments, but they are in business for the sake of profit, and consideration and profit form a fair and proper stimulus to excellence, of which the greatest possible is when improvements have arrived at such a point as to be of the nature of property some kind of limited monoply in them should be given.

"The arguments for the abolition of the patent laws are occasionally based upon the alleged interests of the inventor—*caveat inventor*—he is not compelled to avail himself of them, and at least he need not be provided with a grievance he does not feel. It is said that sometimes a meritorious invention is strangled in its birth because it is so hedged in with patents that it cannot move hand or foot. If these patents are valuable the public is advantaged, and can afford for a few years to dispense with the one new suggestion for the sake of the numerous successful existing ones; if they are valueless, their proprietors will be only too glad to accept some consideration for the use of that from which they have hitherto derived nothing but vexation and loss. If the new comer is such a weakly bantling that it cannot afford to pay for the use of existing patents it does not merit sympathy. I cannot understand why a patentee should be assumed to differ from other tradesmen; his royalties, like any other commodities, may be bought at a fair price.

"The cost of maintaining a patent at law is so considerable, and the risk of failure so great, that patentees usually prefer to enter into equitable compromise rather than embark in an expensive law suit, and very few but really valuable inventions are defended when attacked. The public, therefore, are not seriously hampered by the existence of valueless patents; and yet the hope of obtaining a profitable monopoly affords the greatest possible incentive to the enterprising inventors. Some inconvenience, too, might be risked to insure the great advantage of having new discoveries fully and fairly explained, instead of being kept as secret as possible, and eventually, perhaps, dying with the inventor. At the Manchester meeting of the Royal Association this subject was discussed, and an instance was given of the inconvenience occasionally experienced. The case was that of a railway company who suddenly bethought themselves that solid wheels to their carriages would be a good thing, but they found that they could not adopt the idea because some one had patented it a few years previously. This proves nothing except that if the railway company had availed themselves of the opportunity afforded them they might have adopted the improvement some years before it occurred to their own minds. If they could make no reasonable arrangements with the patentee for the present use of his invention they would not have to wait very long for the expiration of his patent.

"The present plan of prolonging patents for short periods is admirable; it weeds out the sickly and unprofitable patents. People at first are so sanguine of success that they will pay large amounts to secure a monopoly in their

inventions; but when year after year passes and brings them no profits, but plenty of outgoings, they become sick at heart and demur to pay further sums to prolong a patent which yields them nothing. It drops out of the way of succeeding discoverers, who may, however, obtain from it valuable hints and great assistance in perfecting their own inventions.

"Nearly every civilised nation has found it necessary to afford protection to inventors; and it seems in the interests of the community at large to be so important to do so, that I sincerely trust our present patent laws will not be repealed until efficient substitutes for them are devised."

The reply of the *Times* it as follows:—

"Mr. Pontifex misapprehends the effect of our remark that if patents were abolished the inventor would still have its priority and his secret; he could use his discovery, and, if publicity were a necessary consequence of use, the public should not be called upon to pay for what is in its nature incapable of appropriation. We were arguing against any supposed natural right of an inventor as the basis of our existing legislation, and, consistently with this view, proposed to leave him alone to make what use he could of his discovery. We are not called upon to interfere because use necessitates publicity. The point is that the State or community at present goes out of its way to make a bargain with an inventor. It says to every man, 'If you think you have made a discovery and will come and tell the world what it is, you shall, provided it is a discovery, have the exclusive use of it for fourteen years.' The offer is all on one side; if the man who believes he is an inventor thinks he can make more by keeping his secret, he never takes out a patent at all. The State voluntarily offers terms which may be accepted or refused on the part of the discoverer. No one would have a right to complain if the community receded from this position, and left inventors to take care of themselves. It is, in fact, a departure from the ordinary principle of non-interference in trade, to volunteer to create an exclusive right; and the burden of showing that this exception to the general rule is expedient rests upon the upholders of patents. It is in vain for them to talk of an abstract right in inventors to an exclusive use to their discoveries. There is no such thing; the inventor is no whit damnified if he is let alone, and it must be shown that it is to the advantage of the public to enter into such a compact with him as is involved in the existence of patents. This is the answer to the argument advanced by Mr. Pontifex, derived from the copyright of authors. It is quite true that the author can no more claim protection as of right than the inventor can; there is no such thing as copyright at common law; but it is evident that many arguments may be advanced in favour of the expediency of copyright in literature which are inapplicable to patent right in arts. It is, for example, a sound argument against the allowance of patents that the exclusive right given to a discoverer in April prevents a man who makes the same discovery by an independent process in May from using is own invention. It takes away his natural freedom of carrying out what he has innocently invented. This is a fact of constant occurrence in mechanics, but it would be ridiculous to suppose that it can be paralleled in literature. No two men ever invented the same book, and the copyright of one author cannot derogate from the rights of a second. Whether on the whole the arguments in favour of copyright are sound may, perhaps, be doubted. If Mr. Pontifex thinks them invalid, we shall not quarrel with him. It is no doubt true that the best works of literature, those which possess an immortal value, were written without the stimulus of copyright, and it is equally true that copyright does directly produce some baneful effects. But on whatever side the balance may incline on the question of copyright, it is clear that the arguments in support of it differ entirely from those in support of patents, and we are not driven, as Mr. Pontifex supposes, to the conclusion that copyright must be abolished because we believe patents to be unnecessary and inexpedient.

"The real question at issue is, why should the State go out of the way to invite mechanical and chymical inventors to make a bargain with it? What are the considerations which warrant this unusual action? In whose interest should it be maintained? Is it to the advantage of inventors themselves, or of the capitalists who work their inventions, or of the public at large, that a right of exclusive use should be given to the man who registers a discovery? We believe that on examination no one of these classes will be found to be benefited by the Patent Laws, and if this conclusion be correct the laws are at once condemned. It is, indeed, generally acknowledged that, whoever profits by Patent Laws, inventors do not. Take any one of the numerous mechanical discoveries which have been patented within the last 20 years and search out the history of the inventor. He will, in a vast majority of cases, be found to be a poor working engineer, employed in some great manufactory; as to the invention, it is not his property, he was compelled to sell the Patent almost before he obtained it, and he is lucky if, in spite of every sacrifice, he is not loaded with debts contracted in his efforts to perfect his machine. And if this be the case with a successful inventor, what can be said of the still more numerous class who are lured by false hopes into endless discoveries which are neither new nor true? The position of the capitalist manufacturer is not much better; whatever may be his trade, he is constantly exposed to the necessity of buying up one little Patent after another, or to find his improvements hampered because some trifling detail has been registered by a man with whom it is impossible to enter into a reasonable negotiation. Not unfrequently he has to suffer the mortification of discovering that the invention he has purchased from one man had been previously patented by another, and he has to buy it over again or stop his business. We believe that neither inventor nor capitalist reaps any real advantage from the existing law, and that the only persons who are benefited by it are the Patent agents and lawyers. The public at large are the real sufferers; they have to pay twice over for every proved invention, for they have to provide not only the honest rewards of capital and industry, but the costs of expensive lawsuits and abortive schemes.

"The defender of the Patent Laws will often confess that through their agency inventions cost the public more, but he contends, on the other hand, that without them no inventions at all would be perfected. Unfortunately for him reason and experience alike discredit his argument. The instinct of economy is too strong in man to require any inducement to call it into exercise. The principle of least action is a law of morals no less than of physics. Every man constantly endeavours for his own convenience to do his work with the least labour, and the saving of labour is prompted by the immediate, and not by the prospective, reward. Those who look upon the existence of Patent Laws as the necessary condition to an invention may be asked whether there were no inventions before patents were so much as dreamt of. The discoveries of printing and of gunpowder are two of the most important facts of modern history; but no exclusive rights prompted or rewarded their inventors. In our own day can it be said that the hope of commercial profit promoted the discovery of the electric telegraph? But it is unnecessary to refer to particular instances. There is a country of Europe, small in extent but one of the most famous in the inventive arts, the chosen home of many of the most delicate forms of mechanical industry—we mean Switzerland, where until recently, and for aught we know still, no Patent Law whatever existed. Discoveries were made there and inventions perfected in the interest of inventors themselves. Such an example dispels the notion that Patent Rights stimulate discovery, and disposes of the last argument of their advocate. The entire abolition of a system which does not benefit the inventor, which hampers the

producer, and taxes the purchaser, would, in the words of a great inventor, Sir Isambard Brunel, be 'an immense benefit to the country.' "

EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 613.)

CHEMISTRY.

THREE HOURS ALLOWED.

No candidate is allowed to answer more than three questions in each division.

FIRST DIVISION.

1. What loss of weight will 300 grains of oxide of copper undergo by heating to redness, in contact with 5 grains of hydrogen? What weight of water will be formed?
2. How is nitric acid most conveniently prepared on a mall scale? What are its commonest impurities, and how are they detected?
3. How is chlorate of potash usually prepared? How much oxygen is contained in a pound of the salt?
4. By what process is sulphur for the most part removed from coal gas? What compound of sulphur remains in the gas after the partial purification?
5. How is silica detected in minerals? How separated from water?
6. Explain by symbols the action of sulphuric acid on bone-earth. Also, the action of ammonia on superphosphate of lime.

SECOND DIVISION.

1. In what reaction does tin resemble arsenic and antimony? How is it separated from those metals?
2. Explain, by an equation, the action of nitric acid on metallic copper. Also, that of sulphuric acid on metallic mercury.
3. How would you analyse brass?
4. How is alumina detected in presence of chromic oxide?
5. How is magnesium prepared? Describe its chief properties.
6. Describe the manufacture of soda, and name ist chief impurities, and explain how you would test for each of them.

THIRD DIVISION.

1. Describe and explain the process of sugar boiling and also that of sugar refining.
2. How is acetic acid prepared from wood? How is acetic acid distinguished from formic acid? How is anhydrous acetic acid prepared?
3. To what family of compounds does the essential oil of bitter almonds belong? How is it purified?
4. What is the action of litharge and water on olive oil? Give the formula of some of the proximate constituents of the oil?
5. How is lactic acid most conveniently prepared in large quantities? What is its composition? Describe one or two of its salts.
6. What are the chief constituents of opium? Describe their preparation and properties.

ANIMAL PHYSIOLOGY.

THREE HOURS ALLOWED.

1. Describe the microscopic structural elements found in the blood of man. What other animals besides man possess a true blood? In what respect does the blood of such animals differ from or resemble human blood microscopically?
2. Give an account of the coagulation of the blood, of the attendant changes in that fluid, of the influences which accelerate, retard, or prevent it, and of the chief theories concerning the nature and cause of that process. Does coagulation occur in the living body, and if so, what uses may it serve?
3. Name the chief proximate constituents of animal and vegetable food and drink; describe their general sources and characters, and give their ultimate chemical composition.
4. Mention some illustrations of the destination of the several proximate constituents of food and drink in the animal economy; and explain, on general principles, the command man possesses of regulating the condition of his body by the use of special kinds of food.
5. Give a physiological explanation of the way in which drowning causes death. What is the condition physiologically of a person apparently dead from recent immersion in the water? What are the special objects to be aimed at for his recovery; and what might a non-professional person do immediately for the attainment of those objects?
6. Name and describe that part of the eyeball which receives and is excited by luminous impressions. What circumstances are calculated to preserve its functions unimpaired, and what may weaken or destroy it,

BOTANY.

THREE HOURS ALLOWED.

The Candidate is expected to answer correctly four questions in Section I. and six questions in Section II.; Nos. 8, 9, *and* 10 *of the latter each standing for an answer.*

SECTION I.—VEGETABLE PHYSIOLOGY.

1. Explain the general nature of the chemical changes which take place during *germination*. By what conditions are the changes determined?
2. In what what way are the functions of plants grown in glass houses liable to be affected by *nocturnal radiation?* How may its ill effects be obviated?
3. What functions are liable to be interfered with by *transplanting?* Explain this interference and how it may be guarded against.
4. What is the *micropyle?* What relation does it bear to the *radicle?* And, in the two principal types of ovule, to the *hilum?*
5. What is meant by a *spurious dissepiment?*
6. What part do *oils* play in vegetable economy? Where are they usually found? Name three genera, belonging to different Natural Orders, affording oil for economic uses.

SECTION II.—PRACTICAL BOTANY.

1. Describe the structure and theoretical composition of the *column* of the flower of an *Orchis.*
2. Explain the morphological change in the so-called *double flowers* of *Rose, Tulip,* and *Dahlia.*
3. Describe the principal modifications of the fruit in British genera of *Rosaceae* (including *Pomaceæ, Drupaceæ, Roseæ,* and *Sanguisorbeæ*).
4. What peculiarities distinguish (1) the structure of the *wood,* (2) the form and arrangement of the *leaves,* (3) the structure of the *pollen,* and (4) the structure of the *female flower* of *Pines?*
5. Give the diagnostic characters of the Natural Order *Cucurbitaceæ.*
6. How does wheat (*Triticum*) differ from rye (*Secale*)?
7. Name the *Genus* and *Natural Order* to which the plants marked A, B, C, D, respectively belong, with reasons for your opinion.

8, 9, 10. Describe the three plants marked A, B, and C, strictly in accordance with the form given in "Descriptive Botany," chap. vii.

AGRICULTURE.

THREE HOURS ALLOWED.

I.

1. How is the fertility of the soil increased by (*a*) drainage, (*b*) tillage, (*c*) liming, and (*d*) rest in clover and grass, respectively?

2. Describe the drainage of a clay-field on a uniform and gentle slope, stating the probable depth, direction, and interval of drain you would adopt, and the probable cost per acre you would incur.

3. Name the operations in their order by which you would conduct the autumn cultivation of a foul wheat stubble.

4. Describe the operation of liming, naming the proper time for it in rotation, the proper quantity to apply per acre, and the time and mode of application.

II.

5. Name three or four commonly-adopted rotations of crops, and state the circumstances for which each is specially adapted.

6. State the dressings of manure generally applied per acre to the commonly-cultivated crops of the farm.

7. Describe the cultivation of the potatoe and of peas, relating the proper previous cultivation of the land, the sorts selected, the seed time, cultivation during growth, harvesting, and produce per acre.

8. What is the proper treatment, in order to its improvement, of a poor and foul pasture?

III.

9. Describe shortly the breeding and rearing of (*a*) cattle, (*b*) sheep, and (*c*) swine.

10. What quantity of mutton are you likely to make of 50 acres (say 800 tons) of swedish turnips, 6 tons of linseed cake, and 12 tons of good hay?

11. What is the ordinary cost to the farmer of the following operations:—(*a*) ploughing, (*b*) harrowing, (*c*) rolling, (*d*) mowing clover, (*e*) hoeing wheat, (*f*) hoeing and singling turnips, (*g*) cutting and harvesting wheat (*h*) per acre, and threshing and cleaning wheat, oats, and barley per quarter, respectively?

12. What amount of capital is needed on a farm of 1,000 acres of light soil (cultivated on the 4-course system of crops), under the following heads:—(*a*) rent and rates —30s. per acre, (*b*) labour, (*c*) seed and manure, (*d*) working cattle and implements, (*e*) live stock?

(*To be continued.*)

Fine Arts.

Stained Glass Competition.—The Committee of Council on Education desire to obtain for the South Kensington Museum a design for a stained glass window, having a northern light, with semicircular head, and of the following dimensions—viz., 18 feet 9 inches high to crown of arch, by 11 feet wide. The window may be seen on a staircase at the north-west corner of the Great Northern Court. The architectural decorations of the staircase will be of an Italian Renaissance character. The subject of the design is furnished by the 38th chapter of Ecclesiasticus, verse 24 to the end of the chapter. The design is to be on the scale of one inch to the foot, and coloured. It is to be accompanied by a full size cartoon of the design of a sufficient portion to show the execution, and a specimen of a portion of the design executed in glass, of the full size. The competition is open to artists of all nations. A sum of £40 will be awarded for the design which appears to be most suitable, and a sum of £20 for the next best design. The judges will be instructed to award the prizes to the designs solely upon artistic merits, without reference to the probable cost of execution. Each design must be accompanied by a sealed tender, stating the cost at which the design can be executed, the time the execution is likely to take, and the name and address of the artist. The designs and tenders must be sent to the South Kensington Museum on or before the 1st May, 1865. The names of the judges will be published hereafter. The designs to which the prizes are awarded will become the property of the Department, which, however, does not bind itself to execute either of them.

Fine Arts in France.—The distribution of decorations and medals to those artists to whom the prizes were awarded by the jury of the late annual exhibition of works of art in Paris took place on the 13th instant, under the presidency of Marshal Vaillant, Minister of the Imperial Household and of the Fine Arts, who was supported by M. Nieuwerkerke and the other officers of state attached to the department of the Beaux Arts. For some years this ceremony has taken place in the Palais de l'Industrie, where the exhibitions are held, but upon the present occasion the artistic concourse was called together in the *grand salon carré* of the Louvre, the estrade being erected in front of the "Assumption" of Murillo, and facing the great work of Paul Veronese, the "Marriage of Cana in Galilee." The propriety of this famous salon, the walls of which are covered with the *chef d'œuvres* of art, as compared with the bare, cold galleries of the Palais de l'Industrie, for such a ceremony, is self-evident. The proceedings seemed animated by the presence of the *genius loci;* and the recipients of the honours awarded must have felt that they were crowned in the presence of great painters of the past, whose works hung around, and which still are the admiration, the wonder, and the despair of the artists and amateurs of our time. In addition to the medals awarded, and of which notice appeared in the *Journal of the Society of Arts* in May last, the painter Cabanel and the sculptor Clesniger were made officers of the Legion of Honour, and four other French painters, one engraver, a sculptor, and an architect, received the cross of chevalier. Three foreign painters received like distinctions, M. Willems being promoted from chevalier to officer of the legion; and M. Hamman, a Belgian, and M. Achenbach, of Düsseldorf, being nominated chevaliers. On the occasion of the last exhibition, no painting was found worthy of the grand prize, and in sculpture the great medal was awarded to a deceased artist, for what he had done in previous years—"a posthumous honour laid upon his tomb." This is, of course, unsatisfactory to the artistic world, and, moreover, many of the best artists have of late refrained from exhibiting their works. With the view to improve the tone of the exhibitions, and to give further encouragement to men of genius and talent, the Emperor announced, through his minister, at this meeting, that he had created a new stimulus, under the name of the Emperor's Grand Prize, of the value of 100,000 francs (£4,000), to be awarded once in five years to any work in painting, sculpture, or architecture which may be considered worthy of such honour. This great prize is to be at the disposition of a commission, presided over by the Minister of the Fine Arts, and consisting of thirty members, of whom six are to be of the Academy. This prize will only be awarded to French artists, and it will be awarded for the first time in 1869.

Delacroix Exhibition.—The collective exhibition of the works of Eugène Delacroix was thrown open, as announced, on the 13th instant, to a select number of visitors, and on the following day to the public. It cannot be said that it exhibits fairly the genius of the artist—this must be looked for in the ceilings of the Louvre, the Hôtel de Ville, and other great public buildings; but, as a collection of his pictures and sketches, if not complete, it is highly satisfactory, and, with some few exceptions, the works are seen to advantage. The catalogue, which is carefully printed, and gives the name of the proprietor of each work, together with its dimensions, but unaccountably omits the dates of the works in almost all cases, contains more than

two hundred and thirty entries. The most important works are, the two large pictures, the "Battle of Taillebourg" and the "Taking of Constantinople," with the portrait of Marshal Tourville, from Versailles; "Algerian Women in their Apartments," "A Jewish Wedding in Morocco," "The 28th July, 1830," "A Scene from the Massacres of Scio," and the "Dante and Virgil" from the Luxembourg; the "Battle of Nancy," from the gallery of that town; "A Morocco Chief visiting a Tribe," from the Nantes museum; "Christ on the Mount of Olives," from the church of St. Paul and St. Louis, Paris; "Arabian Musicians and Buffoons," from the museum of Tours; "Marcus Aurelius on his Death-bed," from Lyons; and the "Emperor Justinian composing his Laws," from the Chamber of Conseil d'Etat, Paris. The great mass of the works of Delacroix are in the hands of amateurs, his special admirers. Thus, the Baron de Laage contributes nine, M. Aroza, eight, M. Haro, twenty-nine, and Bourruet twelve works, without calculating drawings and sketches. A remarkable work, "Tasso in the Madhouse," is contributed by M. Alexandre Dumas, fils; another, "A Young Woman combing her hair," with a demon grinning behind the mirror in which she regards herself, by M. Auguste Vacquerie. Another notable work is the "Combat between Byron's Pacha and Giaour," the property of M. Malher. As regards the sketches and drawings, their interest is diminished by the fact of their having been seen so recently at the sale of the artist's works, but those who did not see that extraordinary collection will be well repaid by a visit to the present exhibition. Foremost amongst the works of this class is the small pencil sketch known as the "Education of Achilles," the future hero learning the use of his bow and arrow on the back of a centaur, which Delacroix specially named in his will to be offered for sale by public auction, and which fetched the enormous sum of 2,500 francs (£100). In the gallery is a bust of Eugène Delacroix, recently executed by M. Carrier-Belleuse; it is full of character, and will doubtless become popular. Altogether, the Delacroix exhibition on the Boulevard des Italiens will be a great attraction for those who have any artistic taste, and who may visit Paris this autumn.

Sale of Pictures.—The works of art of the late M. Sherbette, deputy, was disposed of the other day by public auction. The collection contained some works by old and rather rare masters, but the connoisseurs were away from Paris, and the prices realised were low, in some cases excessively so. A "Holy Family," by Breemberg (1659), went for £15; "Horses in a Stable," by Géricault, for less than £7; a pair of pendants by Guido Reni, subjects "Astronomy" and "Poetry," the former represented by a young female, with her arms resting on a globe; the latter by St. Cecilia holding a lyre, were sold for £45. A clever painting by Jean le Duc, "A Concert of Amateurs," went for little more than £10; "Cows in a Field, near a Village," signed Paulus Potter, 1648, fetched nearly £16; "The Martyrdom of St. Victor," represented in sixteen compositions, painted on panel by the Gothic School of Cologne, realised £56. Besides the pictures there were a few sketches. A marine sketch, by Copley Fielding, which went for 58 francs; two drawings of horses, by Géricault, which produced 333 francs; a pencil sketch of horses by Carl Vernet, sold for 130 francs, and others of less importance.

Rubens's Chefs-d'œuvre.—Those who pay a visit this autumn to the church of Notre Dame at Antwerp will have the opportunity, for the first time, of judging fairly of the two grand paintings, the "Crucifixion" and the "Descent from the Cross." These magnificent works were, heretofore, not only placed out of the range of ordinary vision, but the *volets*, or wings, were placed in such a manner as to throw false shadows on the central compositions. M. Durlet, the architect, has now removed the pictures to a lower position, and has placed the three portions of each subject in the same plane. This should have been done long since, but "better late than never."

Manufactures.

Petroleum Oils.—The following instructions, relating to the use of these oils for lighting purposes in Paris, have been approved by the Préfect of the Seine and published:—As there is danger in the use of petroleum oils, it is important that the public should be made acquainted with the precautions by which this may be avoided. Petroleum, properly purified, is almost colourless. The litre should weigh not less than 800 grammes. It should not at once take fire on being brought into contact with a lighted body. This essential condition may be easily tested: a small quantity of the oil should be poured into a saucer and the surface touched with a lighted match. If the petroleum has been deprived of the light and very inflammable oils, it will not only not take fire if a lighted match be thrown into it, but the match itself, after burning for an instant, will be extinguished. All mineral oils, intended for lighting purposes, which will not stand this test should be rejected as extremely dangerous. Petroleum oil, even when deprived of the very light spirit, called naphtha, which renders it inflammable in contact with flame, is, nevertheless, one of the most inflammable materials known. If poured on linen cloth or woollen fabrics its inflammability is greatly increased, and great care is needed in its storing and sale. It should be kept or carried in metal vessels only, and the stores where it is placed should be lighted either by outside lamps or safety lamps. A lamp for burning petroleum and this class of oils must have no cracks or flaws in the parts surrounding the wick. The receptacle for the oil should be sufficiently large to hold more than enough oil for each burning, so that the lamp may not become empty whilst burning. Transparent receptacles, such as glass or porcelain, are to be preferred, as the quantity of oil contained may be seen. The receptacle should be thick, and the adjustments should be fixed on it, not merely by tight fitting, but by means of some cement not affected by the mineral oil. The stand of the lamp should be heavy, and with a broad base, to ensure steadiness and render it less liable to be upset. Before lighting a lamp it should be completely filled and then carefully closed. When the oil is nearly come to an end the lamp should be extinguished and allowed to cool before it is opened for refilling. In case, however, it is necessary to fill the lamp before it is quite cool, it is absolutely essential to keep carefully at a distance any light which may be wanted during the operation. If the glass of the lamp breaks, it should be extinguished at once, to prevent the heating of the fittings, for such a heating may be sufficiently intense to vaporize the oil in the receptacle; the vapour may take fire, ending in an explosion destroying the lamp and scattering in all directions a liquid at all times inflammable and frequently in an inflamed state. The best materials for extinguishing these oils when burning are sand, earth, and ashes, and very superior to water. In case of burns, and before the arrival of a medical man, it will be found useful to keep the wounded part covered with linen rags kept continually moistened with water.

Commerce.

Pattern and Sample Post.—The following is an outline of the modifications recently made in the regulations:—On and after the 1st of September next, the following will be the regulations of the Inland Pattern and Sample Post, viz.:—"1. The rates of postage will be reduced by one-third at each step in the scale of charge, and will be: For a packet of patterns or samples not exceeding 4 oz. in weight, 2d.; exceeding 4 oz. but not exceeding 8 oz. in weight, 4d.; exceeding 8 oz. but not exceeding 16 oz. in weight, 8d.; exceeding 16 oz. but not exceeding 24 oz. in weight, 1s. 2. The postage must be

paid by stamps. 3. No packet of patterns or samples must exceed 24 oz. in weight. 4. The patterns or samples must not be of intrinsic value. 5. There must be no writing or printing, in addition to the address of the person for whom the packet is intended, except the address of the sender, a trade mark and numbers, and the prices of the articles; otherwise the packet will be treated as a letter. 6. There must be no enclosure other than the samples themselves. The particulars which are allowed to be furnished under the preceding rule must in all cases be given, not on loose pieces of paper, but on small labels attached to the samples or the bags containing them. 7. The patterns or samples must be sent in covers open at the ends, so as to be easy of examination. Samples, however, of seeds, &c., may be enclosed in boxes made of cardboard, or in bags of linen or other material fastened in such a manner that they may be readily opened. Bags so closed that they cannot be readily opened, even although they be transparent, must not be used for this purpose. 8. If a packet of patterns or samples be posted altogether unpaid, it will be charged with double the postage which should have been prepaid. If a portion of the postage be prepaid, even although only a penny stamp be affixed, the packet will be charged with the amount of the deficiency, together with an additional rate of twopence. 9. In order to prevent any interruption to the regular transmission of letters, a packet of patterns or samples may, when it is necessary, be kept back for twenty-four hours. 10. The rule which forbids the transmission through the post of any article which might injure the contents of the mail bags or the officers of the Post Office is so far relaxed as to permit the transmission of scissors, knives, razors, forks, steel-pens, nails, keys, watch machinery, metal tubing, pieces of metal or ore, and such like, as samples, provided that they be packed and guarded in so secure a manner as to afford complete protection to the contents of the mail bag and the officers of the Post Office, while at the same time the samples may be easily examined; and provided also that such samples as might be in themselves of intrinsic value are rendered unsaleable by being slightly damaged before they are posted. 11. Information as to the best modes of packing the articles named in the preceding clause may be obtained at the secretary's office, General Post Office, London. 12. The preceding regulations do not affect the transmission of patterns or samples beyond the United Kingdom. The rules and rates of postage of the Pattern Post between this country and various colonies and foreign countries remain unaltered.

Obituary.

Professor Ferrier, of St. Andrews, was born in Edinburgh on the 16th of June, 1808, and died on the 11th July, 1864, being thus nearly 65 years of age. His father was John Ferrier, W.S., one of Sir Walter Scott's brother clerks of session, and his mother was Margaret Wilson, a sister of Professor Wilson, the chief of the early brilliant staff of *Blackwood's Magazine*, and well known to the literary world as Christopher North. His aunt by the father's side, Miss Susan E. Ferrier, was the authoress of three novels that still keep their ground with the public, namely, "Marriage," "The Inheritance," and "Destiny." His mind grew and opened up in this literary atmosphere. As a boy he had been amused by the pen-and-ink caricatures of Lockhart, "The Scorpion who delighteth to sting the faces of men," and astonished by witch stories told by Hogg, "The Ettrick Shepherd." His scholastic education was begun under Dr. Duncan, minister of Ruthwell, an earnest classical scholar. It was continued under Dr. Burney, of Greenwich, and afterwards at the Universities of Edinburgh and Oxford, at the latter of which he took the degree of B.A. He gained the prize for the best poem in the Moral Philosophy Class in Edinburgh, and his verses are still remembered by his contemporaries at Oxford, one of whom was Sir Roundell Palmer, the present Attorney-General. In 1832 he, like most of the young aspirants to literature in Edinburgh, entered the Faculty of Advocates. His family connection with lawyers secured him a fair amount of junior counsel practice; but he did not care for forensic work and legal hair-splitting, and his most industrious hours were spent over metaphysical and general literature. In 1837 he married his cousin Margaret, Professor Wilson's eldest daughter, who inherited not a little of her father's wit and talent. In 1838-39 he contributed to *Blackwood's Magazine* a series of papers on the "Philosophy of Consciousness," written in a popular and poetical style, and characterised by great acuteness, eloquence, and ingenuity. He was elected Professor of Universal History in the University of Edinburgh by his brethren of the Faculty of Advocates, who were patrons in 1842, and in the session of 1844-45 he read Sir William Hamilton's lectures on "Logic and Metaphysics," occasionally entertaining the students by speculations of his own, expressed in a more flowing style than Sir William's lectures, and illuminated by the enthusiasm of youth and faith. In 1845, under the strong recommendation of Sir William Hamilton, Sir E. Bulwer Lytton, and many others distinguished in literature, he was appointed to the Chair of Moral Philosophy in the University of St. Andrews, which office he held to his death. This chair was formerly held by Dr. Chalmers, the great pulpit orator of Scotland. When his father-in-law, Professor Wilson, in 1852, through failing health, resigned the Edinburgh Moral Philosophy Chair he became a candidate for it, but was unsuccessful. He was again a candidate to the same patrons, when Sir W. Hamilton's chair fell vacant through death, in 1856, and was again defeated. It was thought that his not being a "Free Churchman" militated against his success in both these cases. Another probable cause was, that he had edited a republication of Professor Wilson's "*Noctes Ambrosianæ*" in the text of which several leading whigs and littérateurs were attacked. In the interval between these two unsuccessful canvasses for Edinburgh chairs, besides editing the popular edition of his father-in-law's works, he prepared for the press his "Institutes of Metaphysic; a Theory of Knowing and Being," which was published in 1854. For two or three years previously he had been teaching the doctrines of it to his class, and he had the ideas pretty thoroughly thought out before he began to write, and long occasional passages quite finished, but the general expression of the bulk of it was dashed off *currente calamo*, and scarcely altered afterwards. For ease, perspicuity, variety, elegance, delicate lights and shades, and the glow of poetry, the style of the work has perhaps hardly any parallel in English philosophical literature. It has almost the subtle lucidity of Berkeley or Hume, with a humour nearly equal to that of the latter, and more poetry than either, and a strength of idealistic faith not inferior to that of Berkeley, to whom Pope ascribed "Every virtue under heaven." No historical portrait so closely resembles Professor Ferrier as that of Bishop Berkeley, in Trinity College, Dublin. Upon his tall, spare figure, and beautiful classic face, nature herself had set the impress of philospher and gentleman. Among his lectures there were some valuable expositions of the history of philosophy, and some curious disquisitions on the affinity of philosophy and poetry, which it is hoped will yet be given to the world. He succeeded the present Archbishop of York as Examiner in "Logic and Mental Science" to the Society of Arts.

Monsieur Hachette.—On the 2nd of August took place in Paris the funeral of one well known in the literary world, and whose labours for forty years have exercised considerable influence on the advancement of mental culture. M. Hachette, the celebrated publisher, was born at Réthel (Ardennes), in the year 1800. At 19 years of age he entered the Ecole Normale, which he quitted in 1822, at the time of taking his degree. The

beginning of his fortunes, so brilliant in the future, was of a modest character. He commenced his industrial career with one single work, *Le Traité de Versification Latine*, by M. Quicherat, his fellow pupil, but he gradually ventured further, exhibiting great skill and tact in carrying on his undertakings. He may be said to have done more in the production of classical works than any other man of his age. His activity, however, was not limited to such works as these alone, but embraced literary works of all kinds. He died at the age of 64, leaving an enormous business, well established on the firmest foundations, which now rests in the hands of his sons and sons-in-law, who, by following in the footsteps of their father, cannot fail to render the business one of the largest of its kind in the world. M. Hachette was followed to the grave by men of note of all classes, his son, M. George Hachette, and his sons-in-law, MM. Templier and Breton, attending as chief mourners.

Publications Issued.

THE LINEN TRADE, ANCIENT AND MODERN. By Alexander J. Warden, Merchant of Dundee. (*Longmans and Co.*) The author, in his preface, states that the object of his book is to supply a want that has long existed,—a comprehensive history of so important and ancient a manufacture as that of linen and the commerce connected with it. The work is dedicated, by permission, to the Chamber of Commerce of Dundee, to the directors of which, as well as to other individuals, he considers himself much indebted for information and for facilities in the consultation of many works connected with the subject. The author commences by treating of the various raw materials employed, discussing the cultivation of flax, hemp, jute, and various other fibres, and giving the statistics of the trade in them. He then enters upon the linen of the ancients, the Bible linen, the linen of the Egyptians, the Phœnicians, the Grecians, and the Romans. In Section 3 is given the substance of some popular lectures, prepared by Mr. W. Miller, of Dundee, and delivered by that gentleman to audiences in that place. The author then passes on to the modern linen trade, taking first the continental, embracing the Italian, Spanish, German, Dutch, French, Russian, Chinese, American trade, and then entering upon that of the United Kingdom, divided under the heads of English, Irish, and Scotch, tracing the history of the trade from its commencement down to the present time, with copious statistics derived from the Board of Trade, and other available sources. The writer concludes his book with a short and popular description of the various manufacturing operations connected with the different materials employed. In doing this there is no attempt to make his volume a handbook to practical manufacturers —that was foreign to the object of the work, and would indeed have been impossible without drawings. The treatment of so complicated a subject would require a volume to itself.

COFFEE AND CHICORY, their culture, chemical composition, preparation for market and consumption, with simple tests for detecting adulteration, and practical hints for the producer and consumer, by P. L. Simmonds, author of the "Commercial Products of the Vegetable Kingdom," "A Dictionary of Trade Products," &c., with numerous illustrations (*E. and F. N. Spon*).—In this handbook the fullest descriptive and statistical details are given respecting the introduction and progress of the culture of coffee in every producing country. Precise details as to supply and consumption are also given; and a large amount of chemical research as to the composition of various coffees, and the distinguishing characteristics of the different commercial varieties of berries are furnished. There are ten good woodcuts, illustrating the plant, scenery of plantations in the east and west, buildings, pulping machinery, &c.

Notes.

SAFETY IN RAILWAY TRAINS.—The Board of Trade has issued a circular to the various railway companies, saying that they have had under their consideration the complaints, frequently urged on their attention, of the danger existing or apprehended from the want of means of communication between the different portions of a railway train while in motion, and are desirous of calling the attention of railway companies to this subject, with a view to the consideration how far, by means of increased facilities for communication between different portions of a railway train while in motion, or other improved regulations, it may be practicable to obviate the evils complained of. The circular goes on to say:—"Several expedients have been suggested as calculated in some degree to further the desired object. One expedient for guarding against offences in railway carriages, which has been proposed is that of placing windows between the compartments of each carriage. As these windows might be provided with curtains, the privacy of the carriages need not ordinarily be interfered with. As an expedient for providing means of communication between the guard and the passengers, it has been suggested that every vehicle forming part of a passenger train should be furnished with footboards and handrails, which would admit of the guard (or, in case of emergency, other persons) passing along the train. It appears to my lords deserving of consideration whether this expedient, guarded, of course, by carefully-framed regulations, to prevent abuse, might not be generally adopted with very beneficial effects. The use of a cord running along the train, by means of which the guard can attract the attention of the engine driver, has now existed on some lines so long as to prove that there is no difficulty in its application." In conclusion, the Board ask for the opinion of the directors as to the practical value of arrangements of the nature specified, and invite any suggestions which the directors may think adapted to accomplish the ends in view; particularly desiring to be informed whether, with a view to the application of such means to the carriages of one company passing on the line of another company, any regulations of a general and compulsory character are deemed expedient.

To Correspondents.

ERRATUM.—In the last number, paragraph 6, page 620, for "31st February," read "28th February."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par.
Numb. *Delivered on 18th and 19th July*, 1864.

406. Casual Poor—Regulations, &c.
463. Civil Contingencies Fund—Accounts.
484. Income Tax (Ireland)—Return.
201. Bills—Criminal Justice Act (1855) Extension (amended).
202. ,, Westwinister Bridge Traffic.
206. ,, Bank Notes, &c., Signature.
208. ,, Facilities for Divine Service in Collegiate Schools.
209. ,, Clerk of the Peace Removal.
210. ,, Salmon Fisheries (Scotland) Acts Amendment.
211. ,, Bank Post Bills (Ireland).
213. ,, Indian Medical Service.
214. ,, Corn Accounts and Returns.
215. ,, West Indian Incumbered Estates Act Amendment.
217. ,, Exchequer Bonds (£1,600,000).
218. ,, Fortifications (Provision for Expenses).
219. ,, Metropolis Management Act (1862) Amendment.

Denmark and Germany—Correspondence (1858).
Denmark and Germany (No. 7)—Correspondence (1864).

Delivered on 19th July, 1864.

405. National Education (Ireland)—Return.
409. Soldiers and Police—Return.
491. Public Income and Expenditure—Account for the year ended 30th June, 1864.

492 Metropolitan Improvements—Return.
212. Bills—Contagious Diseases (amended).
220. ,, Cathedral Minor Corporations.
North America (No. 16)—Further Papers respecting the arrest and imprisonment of Mr. James McHugh.
North America (No. 17)—Correspondence respecting the enlistment of British Subjects.

Delivered on 20th July, 1864.

431. Cattle Diseases Prevention and Importation Bills—Report.
467. Convict Prison Dietaries—Report.
488. Bankruptcy—Return.
489. Bankruptcy—Returns.
221. Bills—Private Bill Costs.
222. ,, Poor Removal.
223. ,, Defence Act Amendment.
224. ,, Poor Relief (Metropolis).
225. ,, Stamp Duties Act (1864) Amendment.
Colonial Possessions (Past and Present State) (Part I.)—Reports.

Delivered on 21st July, 1864.

339. East India (Engineers' Establishment, &c.)—Returns.
457. Gas Companies (Metropolis)—Accounts.
478. West India Incumbered Estates Acts—Circular Despatch, Memorial, Correspondence, &c.
505. East India (Paper Currency, &c.)—Papers and Correspondence.
226. Bills—Pilotage Order Confirmation (No. 2) (amended).
227. ,, Bribery at Elections.
228. ,, Civil Bill Courts (Ireland) (Lords Amendments).
229. ,, Portsea Island (Rights of Way).
Defence of Spithead—Report of a Special Committee.

Delivered on 22nd July, 1864.

480. Kitchen and Refreshment Rooms (House of Commons)—Second Report from the Select Committee.
485. East India (Medical Service)—Despatch.
502. Redundant List (Public Departments)—Return.
511. Japan—Despatch.
230. Bill—Titles (Ireland).

Delivered on 23rd and 25th July, 1864.

383 (I). Turnpike Trusts—Index to Report.
468. Education (Inspectors' Reports)—Report of Committee, &c.
507 (A). Poor Rates and Pauperism—Return (A), April, 1863 and 1864.
510. Standing Orders Revision—Report.
510 (I). Standing Orders Revision—Report and Evidence.
231. Bills—Mutual Surrender of Criminals (Prussia).
232. ,, Masters and Servants.
233. ,, Naval Discipline.
Defence of Spithead—Plan to accompany Report.
Public General Acts—Cap. 39 to 46.

Delivered on 26th July, 1864.

283. Population, Electors, &c.—Returns.
443. Manchester Parish—Official Correspondence.
473. Turnpike Trusts—Returns.
496. Dockyards—Second Report from the Select Committee.
503. Saltpetre (Calcutta)—Account.
506. Constables' Fees (Tunbridge Wells)—Return.
508. Civil List Pensions—List.
Railways in India—Report for the years 1863-64, by J. Danvers, Esq.

Delivered on 27th July, 1864.

343. East India (Bengal Military Fund)—Correspondence.
522. Estimates for Civil Services (1864-5)—General Abstract.

Delivered on 28th July, 1864.

234. Highways Act Amendment Bill—Lords Amendments.
235. Railways Construction Facilities Bill—Lords Amendments.
236. Railway Companies' Powers Bill—Lords Amendments.
239. Contagious Diseases Bill—Lords Amendments.
240. Thames Conservancy Bill—Lords Amendments.
238. Improvement of Land Act (1864) Bill—Reasons assigned by the Lords for disagreeing to certain Amendments made by the Commons.
520. Bankruptcy—Return.
Public General Acts—Cap. 47 to 72.

Delivered on 29th July, 1864.

517. Vagrants, &c. (Paddington, &c.)—Returns.
521. Supply and Ways and Means (Session 1864)—Return.
523. Friendly Societies (Scotland)—Report.
539. Municipal Boroughs (Ireland)—Abstract of Statement.
482. Captain Melville White—Return.
235. Bills—Railways Construction Facilities—Lords Amendments.
241. ,, Pier and Harbour Orders Confirmation—Lords Amendments.
242. ,, Courts of Conciliation.

Patents.

From Commissioners of Patents Journal, August 5th.

GRANTS OF PROVISIONAL PROTECTION.

Steam boilers, indicating the density of the water used in—1770—J. Saunders.
Steel, manufacture of—1876—J. P. Chambeyron.
Stirrups—1819—W. E. Gedge.
Sub-marine foundations, &c.—1854—T. B. Heathorn.
Sugar funnels or moulds—1855—T. Dixon.
Twist lace machines—1790—S. Whitehurst.
Valves—1834—G. Stevenson.
Washing machine—1812—J. Coton.
Water, cleansing or clarifying—1688—W. E. Newton.
Water wheels, construction of—1768—J. G. Tongue.
Window curtains, arranging and actuating—1843—J. Fraser.
Window sill and window garden, combined—1845—J. Bell.
Windows, apparatus for shutting—1878—C. W. Standish.
Woollen fabrics, drying and stretching—1861—A. Wydler.
Writing, apparatus for—1685—G. Murray.

From Commissioners of Patents Journal, August 12th.

Artificial fuel, manufacture of—1907—R. A. Brooman.
Bedsteads, &c., metallic—1935—E. Cooke.
Boilers, preventing incrustations in—1864—W. Irwin.
Buttons, construction and fastenings of—1730—C. de Wailly.
Buttons, shanks for—1911—P. C. Sassé.
Chimney-pots, construction of—1903—G. Carter.
Copper ore, smelting of—1506—P. Spence and H. D. Pochin.
Cotton gins, &c., rollers for—1901—T. Bourne.
Cotton, rollers used in preparing, spinning, &c.—1917—R. Kay, J. Manock, and G. Dakin.
Drags, &c., adjusting the load contained in—1905—P. H. Moore.
Flax, breaking and stamping—1927—E. Warry.
Floor cloth, manufacture of—1921—S. Hawksworth.
Fire-arms, ascertaining the distance therefrom of objects to be fired at—1887—J. Cope.
Fire-arms, breech-loading—1895—T. Wilson.
Hides, tanning of—1706—T. Sharp.
Horses, apparatus for breaking—1881—J. Newsome.
Iron and steel, preventing oxydation of—1875—J. P. Chambeyron.
Knickerbocker tissues, formation of yarn for—1899—E. Schischkar and C. G. Speyer.
Liquids, apparatus for drawing off—1933—A. Bain.
Liquids, apparatus for measuring—1897—J. F. Hearsey.
Mashing apparatus—1931—C. Garton and T. Hill.
Pocket perfume fountain—1891—P. E. Fontenay.
Railway carriages, &c., arrangements for stopping—1893—J. Long.
Railway carriages, signalling between passengers and guards—1929—W. T. W. Jones.
Railway trains, direct communication between guards and passengers of—1853—G. Lansdown.
Rifled ordnance, projectiles for—1856—B. Britten.
Sewing machines—1923—A. Smith.
Shafts and girders, manufacture of—1831—C. Sanderson.
Ships, propelling and steering—1925—J. H. Johnson.
Shot, shells, &c.—1772—J. McG. Croft.
Spinning and doubling, self-acting mules for—1808—C. Whittaker and J. Cocker.
Textile fabrics, apparatus for finishing—1879—S. Hiley.
Umbrellas and sun-shades—1761—W. White.
Washing machine—1883—H. Moon.
Window blinds, rollers of—1909—J. Everard.

From Commissioners of Patents Journal, August 16th.

PATENTS SEALED.

399. F. C. P. Hoffmann.
401. J. and M. Deavin, and J. H. Sutton.
402. J. A. Lloyd.
406. E. Moore.
407. H. A. Jowett.
408. H. Newmane.
419. J. Travis.
420. R. C., R. J., and J. E. Ransome.
423. W. Hickling.
425. E. Butterworth.
426. J. B. Jude.
432. F. J. Arnold.
437. W. Hale.
439. E. E. Allen.
442. F. R. Mosley.
444. W. Brookes.
447. G. P. Gee and W. H. Gosling.
448. J. Drabble.
449. J. Oldknow and J. Wood.
453. J. Howard, J. Bullough, and T. Watson.
467. C. Esplin.
470. T. Rowatt, jun., and A. Lighbody.
472. J. F. Rivier.
490. F. Ransome.
495. J. M. Worrall & S. Cooper.
505. S. Cooper & J. M. Worrall.
520. W. Noton.
523. E. F. Pastor, jun.
535. H. Bennison.
550. M. Henry.
576. E. Cowles.
584. J. P. Worrall.
589. T. Greenwood & H. Hadley.
647. C. Anderson.
670. P. A. L. de Fontainemoreau.
1048. F. Bush.
1242. J. Hamilton, jun.
1457. J. Grant.
1603. W. E. Gedge.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1990. R. A. Godwin.
1991. A. F. B. Falgas.
354. T. W. Rammell.
1997. A. Barclay.
2053. W. Bennett.
2002. W. E. Gedge.
2039. J. Combe.
2102. W. Baines.
2220. T. Greenwood.
2009. J. Jacob.
2038. C. W. Kesselmeyer and T. Mellodew.
2032. J. C. Martin.

Registered Designs.

Blind pulley—4639—Caldicott and Collins, Birmingham.
Match box or holder for suspending against a wall—4640—Jno. Hadley, 3, Royal-terrace, Norwood, S.
A shooting jacket and vest—4641—Jno. Q. Bird, 13, Regent-street, W.
A metallic necktie fastener or scarf ring—4642—Hall and Dutson, Birmingham.
A candle and grease guard—4643—Jas. Richd. Greaves, 524, New Oxford-street.

THE

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AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, AUGUST 26, 1864. [No. 614. Vol. XII.

TABLE OF CONTENTS.

Proceedings of the Society.

CANTOR LECTURES.

"On Chemistry Applied to the Arts." By Dr. F. Crace Calvert, F.R.S., F.C.S.

Lecture VI.*

Delivered on Thursday Evening, April 28, 1864.

Flesh, its chief constituents, boiling and roasting. *Animal black*, its manufacture and applications. Various methods of preserving animal matters. Employment of animal refuse in the manufacture of *prussiate of potash*. A few words on the decay of organic matters, and their fermentation and putrefaction.

It will be easily understood, by those who have done me the honour of attending this course, that this last lecture must touch upon a variety of topics, in order to give an idea of some of the applications which animal matters receive, and which yet remain to be discussed.

Flesh.—M. Chevreul, in 1835, and Baron Liebig, in 1845, examined the changes which flesh undergoes when place in contact with hot and cold water; and the following table, taken from Liebig's interesting work on the chemistry of food, will give you an idea of the composition of flesh:—

Cold water.		Action of boiling.	
Soluble	66	Coagulated albumen	29·5
		Gelatine	6·0
		In solution	30·5
Insoluble	164	Fibres and membranes	164·0
Fat	20		
Water	750		
	1000		

Liebig and Chevreul further succeeded in isolating, from the 30 parts soluble in water, some of the following substances:—

Kreatine	$C_8\ H_9\ N_3\ O_4 + 2\ H\ O$
Kreatinine	$C_8\ H_7\ N_7\ O_2$
Sarcosine	$C_6\ H_7\ N_3\ O_4$
Inosinic acid	$C_{10}\ H_6\ N_2\ O_{10}$
Lactic acid	$C_6\ H_5\ O_5 + H\ O$
Guanine (Scherer)	$C_{10}\ H_5\ N_5\ O_2$
Xanthine (Strecker)	$C_{10}\ H_4\ N_4\ O_4$
Glycocalle ,,	$C_4\ H_5\ N_1\ O_4$
Leucine (Cloetta)	$C_{12}\ H_{13}\ N_1\ O_4$
Osmazone	

The most important mineral salts in flesh are the acid phosphate and lactate of lime, and, according to Fremy, the acid phosphate of potash and chloride of potassium. The above statement shows that flesh is a most complicated substance, and it is easy to conceive that this must be so, when it is remembered that it is derived from blood, of which it contains a large amount; but a most interesting and curious fact is that, whilst blood is rich in salts of soda and poor in salts of potash, in flesh the relative proportion of these salts is directly reversed. Another interesting fact is the small amount of solid matter contained in flesh, and also the small amount of nutritive matter it yields to water under the most favourable circumstances. I repeat "the most favourable circumstances," for when meat is placed in boiling water the 3 per cent. of albumen it contains is coagulated, closing the vessels of the flesh, and preventing all further exit of the fleshy fluids, and such should be the case when meat is intended to be eaten as boiled meat and is properly cooked; but when the object in view is to extract the whole of the matter soluble in water, as in the preparation of beef tea, then the meat should be cut in small pieces, and brayed in a mortar with water, the whole then thrown into clean linen and pressed. The juice of the flesh so obtained should then be carried just to the boil, again passed through the strainer, and after the addition of a little common salt will be ready for the patient. Beef tea, even prepared by this process, which is certainly the best to my knowledge, contains, as the table above shows, but a small quantity of nutritive matter, there being only a little gelatine and a small proportion of the other substances named above. Chevreul attributes the odour of beef tea and meat soups to osmazone, and Liebig to kreatine; in fact, Liebig considers kreatine to be one of the essential substances characterising the aroma of various kinds of flesh. Liebig during his researches on this substance succeeded in obtaining from—

Fowls' flesh	3·21	of kreatine.
Ox heart	1·37	,,
Pigeon	0·82	,,
Beef	0·69	,,

Further he observed, that the flesh of wild animals contained a much larger proportion of kreatine than that of those which were confined; for instance, that there was six times as much in the flesh of a wild fox as in that of a tame one. Allow me to say a few words on the properties of this curious substance, which presents itself in the form of moderately large white rectangular prisms, having a pearly lustre, soluble in water, insoluble in alcohol. Although this substance is neutral, it is converted when heated with hydrochloric acid into another solid crystallized substance called kreatinine, which possesses strong alkaline properties. When kreatine, instead of being treated by an acid is acted upon by baryta, it is converted into an acid compound called inosinic acid. Liebig ultimately succeeded in finding these substances, as well as another called sarcosine, in various animal secretions. I shall not take up more of your time by discussing the chemical properties of these substances, but merely state that they enable us to distinguish real soup tablets from spurious

* This lecture was No. V. when the course was delivered.

ones. For this purpose a solution of the tablet in cold water should be made, when, if genuine, it will give a precipitate with chloride of zinc, whilst the spurious one, which contains gelatine but no kreatine, will not do so. Another reaction is, that the pure article will yield 85 per cent. of its weight to alcohol, whilst the imitation will only yield about five.

Preservation of meat and animal substances.—A low temperature is most favourable to the preservation of flesh and other animal substances, and under that condition it will not enter into putrefaction, the best proof of which is that elephants in a perfect state of preservation have been found in Siberia buried in ice, where they have doubtless existed for many thousands of years. It is also well known that the inhabitants of polar regions preserve their meat fresh by burying it in snow, and I mentioned an instance in one of my previous lectures, viz., the preservation and bleaching of sturgeon's bladders on the banks of the Volga. A high state of desiccation or dryness also contributes powerfully to the prevention of decay. Thus in Buenos Ayres and Monte Video meat is cut into thin slices, covered with maize flour, dried in the sun, and it is consumed largely, under the name of tasago or charke, by the inhabitants of the interior, and also by the black population in Brazil and the West Indies. Further, dried meat reduced to powder is used by travellers in Tartary and adjacent countries, and I may add that of late years meat biscuits have been extensively consumed by the emigrants having to travel from the United States to California and the West Coast generally. It is stated that six ounces per diem of this meat biscuit will maintain a man in good health throughout the journey. A remarkable instance of the preservation of animal matter by extreme desiccation is related by Dr. Wefer, who states that in 1787, during a journey in Peru, he found on the borders of the sea many hundreds of corpses slightly buried in the sand, which, though they had evidently remained there for two or three centuries, were perfectly dry and free from putrefaction. Although it is not within the scope of these lectures to describe the preservation of vegetable matters, still I cannot refrain from mentioning the interesting method adopted by MM. Masson and Gannal, by which, as you are doubtless aware, vegetables are preserved in the most perfect manner. Their process is most simple, as it consists in submitting the vegetables for a few minutes to the action of high pressure steam (70 lbs. to the square inch), then drying them by air heated to 100°, when, after compression by hydraulic pressure, they are made into tablets for sale, and when required for use it is only necessary to place the tablets for five hours in cold water, when the vegetable substances swell out to their former size and appearance and are ready for cooking. As the presence of oxygen or air is an essential condition of putrefaction, the consequence is that many methods have been invented to exclude that agent, or rather, as I shall show at the end of this lecture, the sporules or germs of cryptogamic plants or animals, which are the true ferments or microscopic source of fermentation and putrefaction. Permit me to describe concisely some of the methods proposed; and I believe that one of the best processes for excluding air was that invented by Appert, in 1804. It consists in introducing the meat or other animal substance with some water into vessels which are nearly closed, these are then placed in a large boiler with salt (which raises the boiling point of the liquor), and the contents of the vessels are kept boiling for about an hour, so as to exclude all air, and destroy, by the high temperature, all the sporules or germs of putrefaction they may contain, when they are hermetically closed. M. Chevalier Appert has improved this process in placing the prepared vessels in a closed boiler, by which means he raises the temperature (by pressure) to 234°, effecting thus the same purpose more rapidly and economically. To give you an idea of the extent of this trade, I may state that M. Chevalier Appert prepared above 500,000 lbs. of meat for the French Army in the Crimea. I am aware that many modifications have been applied to this process, but I shall only mention that of Mr. G. McAll, who adds to the previous principle of preservation a small quantity of sulphate of soda, well known to be a powerful antiseptic. The beautiful specimens now on the table, which have been kindly lent to me by Messrs. Fortnum and Mason and by Mr. McAll, will satisfy you of the applicability of the above-named methods for the preservation of meat and other animal substances. But before concluding this part of my lecture, I must add that the preservation of animal and vegetable substances by the exclusion of air and cryptogamic sporules is also effected by other methods than those above described; for instance, they are imbedded in oil, or in glycerine, as suggested by Mr. G. Wilson, or in saccharine syrups. I should not forget to mention that several plans have been proposed for protecting animal matter by covering their external surfaces with coatings impermeable to air. Two of the most recent are the following:—M. Pelletier has proposed to cover the animal matter with a layer of gum, then immerse it in acetate of alumina, and lastly in a solution of gelatine, allowing the whole to dry on the surface of the animal matter. The characteristic of this method is the use of acetate of alumina which is not only a powerful antiseptic, but also forms an insoluble compound with gelatine, thus protecting the animal matter from external injury. Mr. Pagliari has lately introduced a method which is stated to give very good results. It consist in boiling benzoin resin in a solution of alum, immersing the animal matter in the solution, and driving off the excess of moisture by a current of hot air, which leaves the above antiseptics on the animal matter. It is scarcely necessary to mention the old method of using smoke arising from the combustion of various kinds of wood, except to state that in this case it is the creosote and pyroligneous acids which are the preservative agents. The preservation of animal matter by a very similar action is effected by the use of carbolic acid, a product obtained from coal tar. It is much to be regretted that this substance, which is the most powerful antiseptic known, cannot be made available for the preservation of food, but there can be no doubt that for the preservation of organic substances intended for use in arts and manufactures, no cheaper or more effective material can be found. For example, I have ascertained that one part of carbolic acid added to five thousand parts of a strong solution of glue will keep it perfectly sweet for at least two years, and probably for an indefinite period. Also, if hides or skins are immersed for twenty-four hours in a solution of one part of carbolic acid to fifty of water, and then dried in the air, they will remain quite sweet. In fact, hides and bones so prepared have been safely imported from Monte Video. From these facts and many others with which I am acquainted I firmly believe that this substance is destined within a few years, to be largely used as an antiseptic and disinfectant. I need hardly speak of the power of chloride of sodium, or common salt, in preserving animal matters, and it is highly probable that the interesting process described to you on the 13th April, by Mr. J. Morgan, for the employment of salt, is likely to render great service in preserving animal food from petrefaction. But with regard to the feasibility of its use in Monte Video and Buenos Ayres, I cannot offer an opinion, as it depends upon so many local circumstances which it is impossible to appreciate here. Messrs. Jones and Trevethick displayed at the last exhibition some meat, fowls, and game preserved by the following process, which received the approbation of the jurors. Meat is placed in a tin canister, which is then hermetically closed, with the exception of two small apertures in the lid. It is then plunged into a vessel containing water, and after the air has been exhausted through one aperture by means of an air pump, sulphurous aid gas is admitted through the second aperture, and the alternate action of exhausting the air

and replenishing the sulphurous acid gas is kept up until the whole of the air has been removed. The sulphurous acid gas in its turn is exhausted, and nitrogen admitted. The two apertures are then soldered up, and the operation is completed. As I consider the action of carbon on animal matters rather as a case of oxydation than of preservation, I shall refer to that subject further on, and shall, therefore, proceed to consider the employment of certain animal matters not yet alluded to during this course of lectures, such as the flesh of dead animals not used as food, and those other parts of their carcases which have not been applied in any of the processes already described. The greatest part of these refuse matters are used for producing animal black, which differs from bone black, referred to in my first lecture, being used in the state of impalpable powder, whilst bone black or char is composed of small hard grains. The manufacture of animal black is generally carried out by introducing into horizontal retorts connected with a coil or condenser, and with an exit pipe for the gases, some of the animal matters mentioned; on the application of heat decomposition occurs, the oily matters distil and condense in the worm, and constitute what is called oil of dippel, formerly much used in the art of currying certain classes of leather; water also distils, charged with a variety of ammoniacal salts, which are generally converted into sulphate of ammonia for agricultural purposes. As to the gases, they are usually ignited and burnt to waste. The carbonaceous mass which remains in the retort is removed, and ground to powder with water in a mill, allowed to settle, and, lastly, dried and sold under the name of animal black. Its chief uses are in the manufacture of blacking and printing ink. Another manufacture which consumes a large quantity of animal refuse, especially the horns, hoofs, &c., of too inferior a quality to be used for the purposes described in my first lecture, is that of the yellow prussiate of potash, a most important salt, for it is extensively used in calico printing, silk and wool dyeing, and in the manufacture of the pigment called prussian blue, for gilding silver, copper, and other inferior metals; and lastly, it is the source from which cyanide of potassium is procured, a substance much employed in the art of photography. Let me now call your attention to the manufacture of prussiate of potash, the greatest portion of which is still prepared at the present day by the old process devised by Dr. Woodward, F.R.S., in 1724. It consists in introducing into large cast-iron pots American pearlash, melting it, closing the vessel, and then setting the mass in motion by means of a revolving shaft. At this period of the operation, hoofs, horns, and other animal refuse, are introduced in small quantities at a time. Under the influence of heat and of the alkali, the nitrogen of the organic matters splits into two parts, one part combining with the hydrogen to form ammonia, which escapes, whilst the other portion unites with the carbon, producing cyanogen, which remains combined with the potassium of the potash. After several hours the operation is considered to be completed, and the melted mass is run out into small cast-iron receptacles; when cool, these are placed in large vats with water, and a jet of steam is introduced, and the whole is kept on the boil for several hours, when the cyanide of potassium is partly decomposed, giving rise to carbonate of potash and to cyanide of iron, for not only has a portion of the iron of the melting pots been attacked and combined with the mass, but a certain quantity of iron filings has been used during the operation. However, two parts of the cyanide of potassium combine with one part of cyanide of iron, and the result is that a double cyanide, called ferro-cyanide of potassium, or yellow prussiate of potash, is formed. The liquors are then allowed to clear by standing, and the aqueous solution is evaporated until a pellicle appears on its surface, when it is allowed to cool, and the salt is deposited on strings which have been passed through the crystallising vat, and which facilitate the crystallisation of the prussiate salt. In consequence of the large amount of animal matter used as compared with the quantity of prussiate obtained, this salt has always commanded a good price in the market, and has induced many eminent chemists to try to devise cheaper processes for obtaining it. To attempt here to give merely an outline of these various proposed plans would involve so much technical description as would occupy far too much time for this lecture, but I would recommend those interested in this branch of manufacture, to read the learned account given by Dr. A. W. Hoffmann, in his report on "The Chemical Products in the last Exhibition," page 57, where they will find the process of M. Gauthier-Bouchard for obtaining salts of cyanogen from the ammoniacal waters of gas works; those of Mr. R. T. Hughes and Messrs. Bramwell, of Newcastle, for the conversion of nitrogen of the atmosphere into cyanide of potassium; that of M. Kamrodt, for decomposing ammonia by carbon carried to a high temperature; and, lastly, that of MM. Marguerite, and De Sourdeval, for producing cyanogen from the nitrogen of the atmosphere and fixing it by means of barium. This latter process seems to be highly commended by the learned reporter to whom I have referred. I must not, however, omit to mention the scientific and interesting process devised by Mr. Gelis, and based on the chemical reaction which ensues when bisulphide of carbon is mixed with sulphide of ammonium. Yellow prussiate crystallises in large crystals belonging to the octohedral system, composed, as before stated, of two parts of cyanide of potassium, 2 Cy K, and one of iron, Cy Fe + 3 of water or H O. This salt is freely soluble in water, but is insoluble in alcohol, and when mixed with weak vitriol and heated gives rise to prussic acid, which distils, and may be used either as a violent poison or, in qualified hands, as a most valuable therapeutic agent. When ferrocyanide of potassium is heated with several times its bulk of concentrated sulphuric acid, instead of yielding prussic acid, as above, it gives rise to a poisonous gas, called oxide of carbon, which burns with a beautiful blue flame, and which we have all seen burning in our fireplaces when the combustible matter has lost all its volatile constituents and nothing remains but a red incandescent mass. When chlorine is passed through a solution of this salt chloride of potassium is formed, and the yellow prussiate is converted into red prussiate or ferricyanide of potassium, composed of $3\ Cy\ K + 3\ Fe_2\ Cy_3$. When heated with peroxide of mercury, potash, peroxide of iron, and cyanide of mercury are produced, the latter being a most violent poison. To produce Prussian blue on silk with this salt, all that is required is to dip the silk in a slightly acidulated liquor containing a persalt of iron, and when the silk is washed and mordaunted, it is dipped in a weak acidulated solution of yellow prussiate of potash, when it assumes a beautiful blue colour due to the formation of Prussian blue. To dye wool it is necessary to pass it through a boiling bath composed of yellow prussiate, muriate of tin, and a small quantity of sulphuric acid. Prussian blue is gradually formed, and fixes itself on the fibre. To produce blue on calicoes, a solution of yellow prussiate of potash is made, to which is added some tartaric acid and muriate of tin. This mixture, after having been properly thickened, is printed on the calico, and then submitted to the action of steam, the Prussian blue so produced being fixed on the cotton fibre by means of the oxide of tin, resulting from the decomposition of the salt employed.

Nothing is more simple than to gild or silver metals by means of ferrocyanide of potassium, or to cover iron and other metals with copper. To obtain a gilding liquor, it is only necessary to take 1,000 parts of water, adding to it 100 parts of yellow prussiate of potash, 10 parts of chloride of gold, and 1 part of caustic potash. Each of these should be added successively, and the whole of the liquor carried to the boil and filtered. It is then ready for gilding silver or brass objects, when properly attached to the pole of a galvanic battery. The silvering liquor is

made by substituting for the chloride of gold, in the above process, ferrocyanide of silver, prepared by adding nitrate of silver to a solution of ferrocyanide of potassium, the white precipitate resulting being washed and added to the liquor intended for silvering. For covering zinc or iron with copper it is simply necessary to substitute the ferrocyanide of copper for that of silver. Ferrocyanide of potassium, as above stated, is also employed for the manufacture of Prussian blue, which was accidentally discovered by Diesback, in 1718, by adding alum, containing iron, to the ammoniacal liquors sold to him by Dippel, which were produced, as already stated above, during the distillation of animal refuse. These liquors, being rich in cyanide compounds, yielded with the salt of iron of the alum, Prussian blue. At the present day Prussian blue is manufactured by different processes, but they are all based on the principle of mixing various salts of iron with red or yellow prussiate, when double cyanides of iron (or Prussian blues) are produced.

I shall now examine with you some of the various causes which contribute to the destruction of animal matters, when it arises from slow decay or putrefaction. The first of these to which I shall have the pleasure of calling your attention, is that observed by Dr. Stenhouse, who, in 1854, made the curious discovery that, if the body of an animal be buried in a carbonaceous mass, such as charcoal, after a few months the whole of the animal, excepting the skeleton, would entirely disappear; and, what was still more remarkable, was that, though the experiments were conducted within his laboratory, no unpleasant effluvia were apparent to those who were constantly there. This eminent chemist attributed the rapid and complete destruction of animal tissue in these experiments, to the oxidation of the animal matters by the oxygen of the atmosphere; but to enable you fully to understand how this occurs, I must call your attention to the following facts. Lowitz, many years since, observed that charcoal possesses the property of absorbing and condensing in its pores large quantities of various gases, and Theodore de Saussure made an extensive series of experiments, from which I extract the following data:—

One cubic inch of boxwood charcoal, absorbed of—

Ammonia	90	cubic inches.
Hydrochloric acid	85	,, ,,
Sulphurous acid	65	,, ,,
Sulphuretted hydrogen	55	,, ,,
Carbonic acid	35	,, ,,
Oxygen	10	,, ,,
Nitrogen	7	,, ,,

Consequently the absorption or condensation of a gas in charcoal appears to be in proportion to the solubility of the gas in water, and although the condensation by a solid and by a liquid may at first appear necessarily due to different causes, and therefore to bear no relation to each other, yet in my opinion these two actions are identical. Seeing that the gas is condensed by the molecular attraction of the solid, I do not see why the same attraction should not be exercised by the molecules of the liquid. The different degrees of solubility of various gases are no doubt owing to their respective physical properties, such as specific gravity, repulsive or expansive forces of their molecules, &c. I may here mention that I am now engaged in a series of experiments in the hope of throwing some light on this interesting question.

Gay-Lussac in his researches on the condensation of gases by charcoal, found that one gas may expel and take the place of another gas already condensed in the charcoal; and Dr. Stenhouse, following up this observation, states that the gases, vapours, and sporules generated by the putrefaction of animal substances, are absorbed by charcoal and brought into immediate contact with the oxygen of the atmosphere also contained in the pores of the charcoal, which oxidising or destroying the products of putrefaction converts them into water, carbonic acid, nitric acid, &c. These important scientific observations of Dr. Stenhouse have already received practical application; thus Mr. Haywood has established charcoal filters at the mouths of public drains, thereby arresting the escape and diffusion in the atmosphere of the noxious effluvia given off by the putrefying matters in the sewers. Further, charcoal respirators have become extensively used since Dr. Stenhouse called public attention to the valuable properties of this substance; and lastly, atmospheric filters, containing charcoal, have been successfully applied in the houses of Parliament to purify the entering air from any noxious gases it may contain before passing into the building. The natural decay or destruction of organic matters is due to two perfectly distinct causes, one of them chemical and the other physiological. The former has been investigated by many of the most eminent chemists of the day, and no doubt can remain that the action of the oxygen of the atmosphere converts the carbon of organic substances into carbonic acid, the hydrogen into water, the sulphur into sulphuric acid, the nitrogen into nitric acid, the phosphorus into phosphoric acid, &c. Much light has recently been thrown upon these phenomena by Mr. Kuhlman, who clearly shows that the oxides of iron play a most important part therein; thus that the sesquioxide of iron yields its oxygen to the elements of the organic matters; that the protoxide of iron thereby formed absorbs oxygen from the air, which reconverts it into sesquioxide, and this again yields its oxygen to a fresh portion of organic matter, so that sesquioxide of iron is a most powerful oxidising agent, it being, in fact, the condenser of oxygen and the medium of its conveyance to and destruction of organic substances. MM. Chevreul and Kuhlmann have also shown that sulphate of lime acts in a similar manner, namely, that it yields its oxygen to the elements of organic substances, and is thus converted into sulphuret of calcium, which having a great affinity for oxygen is again rapidly converted into sulphate of lime, and thus the oxygenation and destruction of the organic matter is effected. Mr. Millon has published an interesting paper on the formation of nitre, or nitrate of potash, through the ammonia generated during the destruction of organic substances being oxidised into nitric acid, which combines with potash, if present, and if not with lime or magnesia, which are present in all soils. Mr. Millon has remarked that this important chemical reaction is effected by an organic substance called humic acid, which acid, or its homologues, exists in large quantities in all earthy loams containing much organic, and more especially vegetable, matters in a state of decomposition. Humic acid absorbs the oxygen of the atmosphere, which oxidises the ammonia into nitric acid and water. The chemical theory of the destruction of organic matters through oxidation and their absorption of plants and re-conversion into the same substances from which they were derived, such as sugar, starch, gum, oil, essences, &c., or albumen, fibrine, gluten, caseine, &c., was greatly in favour a few years since, as it appeared to fulfil all the requirements of nature. It has, however, been greatly shaken by the beautiful researches of M. Pasteur on fermentation, putrefaction, and spontaneous generation, which prove clearly that these physiological actions play a most active part in the destruction of organic substances. This most skilful chemist has demonstrated that there is no such thing as spontaneous generation, and that the notion entertained by some physiologists, that if matter is placed in favourable circumstances as to heat, light, &c., and in a proper medium, it will become spontaneously animated, is undoubtedly erroneous, and that life in all instances proceeds from a germ or egg in which the vital principle is implanted by the Creator. He proves that life, even in the most insignificant of microscopic creatures, always originates thus, and that there is no single instance of matter being animated by purely physical causes. Let me draw your attention to a few among many facts observed by M. Pasteur, proving that life is not a property of matter, like weight, elasticity,

compressibility, &c., but is always the result of a germ even in its lowest development.

When arterial blood is carefully introduced from the artery into a clean vessel, and there brought into contact with oxygen, no fermentation or putrefaction of the blood ensues; and if the experiment is repeated, substituting for the chemically prepared oxygen, atmospheric air which has been passed through a tube containing pumice stone and carried to intense heat, in this case also, there is no putrefaction or fermentation; but if ordinary atmospheric air be used in the place of pure oxygen, or heated air, and left in contact with some of the same blood, this vital fluid will rapidly putrefy, which is doubtless owing to the presence in the atmospheric air of the sporules or eggs of mycoderma and vibrios, or organised ferments, which give rise to the various chemical phenomena and changes of organic matters into products which characterise fermentation and putrefaction. The same results are obtained when fresh urine is substituted for blood, an important fact, proving that the germs of fermentation do not exist in the fluids themselves, and that fermentation does not proceed from any molecular or chemical change in the composition or nature of the organic substances contained in blood and urine, but that the ferment from which these phenomena proceed is to be sought for in the atmosphere. I shall substantiate this view by several other interesting observations made by M. Pasteur.

If some asbestos is heated to a red heat and plunged into a liquor susceptible of putrefaction, such as a saccharine liquor, no fermentation ensues, but if atmospheric air is passed through asbestos at natural temperature, and the latter then immersed in a similar solution of sugar, active fermentation soon takes place, proving that the atmospheric air has left on the surface of the asbestos sporules of the mycoderma vini, which being introduced with the asbestos into the saccharine fluid, originated the well-known alcoholic fermentation. Another beautiful series of experiments by M. Pasteur is the following:—He introduced into 60 small balloons a small quantity of a highly putrescible fluid, and after boiling the fluid in order to drive out the air remaining in the balloons by the formation of steam, he closed the small apertures, so that on cooling the steam condensed and a vacuum was produced. He then proceeded to open 20 of these balloons at the foot of one of the hills of the Coté d'Or, 20 others at the summit of the same (about 2,000 feet high, and the remaining 20 at a point near Chamounix, and the following results were observed: Of the first 20 balloons the contents of 15 entered into purefaction within a few days; of the second 20 only 6; and of the third 20 only 2 gave signs of fermentation. These results, as well as some others published by M. Pasteur, prove that the sporules or germs of putrefaction and fermentation exist in all parts of the atmosphere, but more abundantly in the lower strata, which are necessarily in contact with great quantities of organic matter in a state of decay, and that these sporules become scarce in the upper regions of the atmosphere, which are further removed from the source of pollution. Further, he has proved, as I stated in my last lecture, when speaking of the preservation of milk, that fluids extremely liable to fermentation or putrefaction, may be prevented from entering into those conditions by heating them to 250° or 260°, a temperature at which the sporules cannot resist decomposition in the presence of water. M. Pasteur has advanced a step further in this interesting inquiry, for he has demonstrated that there are two distinct phases in putrefaction. In the first there are the vibrios produced in the bulk of the fluid containing animal matters in solution, and that these microscopic animals resolve the organic substances into more simple compounds; in the second phase, there are produced on the surface of the fluid cryptogams, which he calls mycoderms, and which absorb oxygen from the air, and oxidise the products developed by the vibrios. In the case of the fermentation of vegetable substances, such as saccharine matters, there are mycoderms (*Mycoderma vini*), which resolve them into, say alcohol and carbonic acid, while other mycoderms (*Mycoderma aceti*) are produced, and grow on the surface of the fluid, oxidising the alcohol into water and acetic acid. He therefore concludes that the animal vibrios and vegetable mycoderms exist abundantly in nature, and that they must be and are the most active causes of the destruction of vegetable and animal substances which have fulfilled their vital function on the earth, reducing them into water, carbonic acid, ammonia, sulphuretted hydrogen, &c., which, in their turn, become the foods of a succeeding generation of plants and animals. We may therefore truly say that death is life in the constantly reviving world.

M. Pasteur has observed another most curious fact connected with these microscopic beings—(I say microscopic, because it requires a most powerful instrument and high powers to distinguish them, and to ascertain that vibrios possess a vibratory motion while mycoderms are stationary); this is, that vibrios are the only animals which can live in pure carbonic acid, and which are killed by oxygen even diluted with another gas. Oxygen is essential to the life of mycoderms, and some of them can also exist in carbonic acid. Lastly, M. Pasteur has noticed that if a very small amount of yeast is added to a saccharine fluid, the yeast will not materially increase in quantity, because the new generation which is produced lives on the remains of its parents; but if phosphate of ammonia or of lime and some sal ammoniac is added with the yeast, the latter will rapidly increase and occupy several times its original bulk. It is curious to observe that these microscopic cryptogams require the same kind of food as man. Thus they require nitrogenated food—so do we. They require mineral food, as phosphates—so do we. They require respiratory food—so do we. They produce carbonic acid as part of their vital functions—so do we. I cannot do better than conclude this part of my subject by giving the following table descriptive of the various ferments observed by M. Pasteur:—

Fermentation.

Mycoderma vini.	Resolves sugar.	Alcohol. Carbonic acid. Succenic acid. Glycerine.
Mycoderma aceti.	Oxidises Alcohol.	Acetic. Water.

Putrefaction.

Infusorial Ferments.

Vibrios resolve animal substances.

Bacterea oxidizes organic matters of an animal origin.

I should mislead you, however, if I did not call your attention to another class of fermentations, which are chemical in their nature and in their action. This, for example, is the case when bitter almonds are crushed and mixed with water. The amygdaline they contain is decomposed into prussic acid, hydruret of benzoil, &c., by the ferment they contain, which is called emulcine. Again, when black mustard is reduced to meal, and placed in contact with water, the myronic acid it contains is decomposed into the essential oil of mustard, a most corrosive fluid, and this is also effected by a special ferment called myrosine. Again, when malt is mashed with water of a temperature of 170°, its starch is converted into sugar by a ferment called diastase. We also know that the starch which we take into our stomachs as food is converted into sugar by animal diastase, which exists in the saliva as well as in the pancreatic juice, and that this conversion is identical with that which takes place in the mashtub. In fact the whole of the changes which our food undergoes to render it fit for assimilation in the digestive organs of the body may be considered as a series of different fermentations. What gives a further interest to

these chemical ferments is, that not only are they all nitrogenated, and possess a similar composition, but they present many identical properties, but each has its own peculiar action, that is, it will only cause fermentation in those matters which have been placed by nature in contact with it. Thus diastase will not convert amygdaline into prussic acid, hydruret of benzoil, &c., nor will myrosine convert starch into sugar.

In conclusion, it is certain that our knowledge of these interesting phenomena of putrefaction, fermentation, &c., is yet in its infancy, and there is no doubt that many important discoveries in this intricate branch of knowledge will from time to time be brought before the world, and reward science for its persevering efforts.

Proceedings of Institutions.

Yorkshire Union.—The twenty-seventh annual report, presented at the annual meeting at Sheffield, on the 18th May last, congratulates the delegates on the continued success which has attended their exertions. The prominent position held by the Institutes of Yorkshire is shown by their large number of members which, on the aggregate, maintains its rate of increase, and testifies to the appreciation in which the work of popular education and social improvement continues to be held. In most of the departments of the Institutes there has been a continuous improvement. The summary of the returns for 1864 shows that the number of Institutes in the union was 131. The total number of members is estimated at 23,500. Those Institutes, from whom reports have been received, give the number of males at 18,464, and of females at 2,107. The annual income of 91 Institutes is £12,500. The number of volumes in libraries of 100 Institutes is 137,421. The number of books added during the year to 100 Institutes was 5,080. The number of lectures delivered at 60 Institutes was 407, of which 93 were paid and 314 gratuitous, and they have been classified as follows:—Scientific, 92; literary, 262; musical, 53. In 68 Institutes, containing 16,418 members, the number of pupils belonging to classes is returned at 6,761. During the year, the agent, Mr. Blake, has delivered 23 lectures, attended 17 soirées, and paid 62 visits to Institutions, for the purpose of giving advice and assistance. He has also superintended the Society of Arts Examinations, the examination of the Science and Art Department, and other examinations in connection with the Union. A few of the smaller Institutes have either ceased to exist, or have discontinued their operations for a time. Either an apathetic feeling for any mental imprevement amongst the young men of the neighbourhood, or the want of suitable premises in which to meet, or the absence of any energy or perseverance in those who should manage the Institute, or the difficulty of obtaining competent teachers at such a rate of remuneration as could be met by class fees; these causes have more or less operated injuriously in some few places, whilst in many places difficulties of a similar character have been overcome by a really efficient secretary, with the aid of perhaps two or three practically working members of a committee. It has sometimes been the case that the loss of a good secretary has been followed by serious damage to the welfare of an Institute, if it has not altogether proved fatal. On the other hand, a slight majority of the Institutes in the union show an increase in the number of members. Some portion of the increase in the number of members may be attributed to the judicious introduction of entertainments of a character more attractive to the great bulk of the population. Attention has before been directed to the advantage of popular readings at a small charge for admission. At Skipton the plan of penny readings has been tried with such great success as to have been introduced into a considerable number of the surrounding villages. The last series consisted of 24 meetings, and the total receipts were £97, leaving a balance of £41 in favour of the Institution after payment of all expenses. From the report it appears that the chairmen who officiated at the meetings included the leading clergymen, ministers, magistrates, professional and private gentlemen. The Ripon report refers to the no doubt very frequent complaints made by the promoters of Mechanics' Institutes, that their Institutions languish and are not sufficiently supported by the working classes. The report then proceeds to contrast the great comparative success of public houses in attracting the presence of the working classes, and goes on to inquire whether the Institutions are not aiming too high, and whether they would not succeed better provided they introduced at least a few of those features which render the public-house so successful in securing the presence of the working man. That these views have considerable force in them, is shown by the success which has attended the recent efforts to establish working men's clubs in various parts of the country. The great feature of these clubs as distinguished from ordinary Mechanics' Institutes, is the introduction of a more social character into them. Conversation is encouraged; chess, draughts, even a smoking room and singing are freely permitted. These features are obviously a great innovation upon the cold and formal aspect of Mechanics' Institutes as usually conducted, and the result has been a very much larger influx of the working men into the former class of Institutes. In Leeds for example, two Working Men's Institutes now contain as many operatives as all the fifteen Mechanics' Institutes of Leeds put together, and this, too, without having in any degree diminished the number of those in the Mechanics' Institutes. Musical entertainments as a popular recreation have been in operation at several Institutes, whilst a combination of reading, singing, recitation, and other means of passing an agreeable evening has been provided at others. Games of chess and draughts, as well as cricket, with other athletic sports, have been made a feature of several Institutes. It has been said that lectures, either as a means of instruction or enterment, have ceased to interest, and have been in a great measure superseded by other sources of attraction. This does not, however, appear to have been the case during the past year in the Yorkshire Institutes, as the returns show a slight increase in the whole number delivered, and this increase is not in those of a literary character, which have diminished, but in a small degree in those which are denominated scientific, and more largely in those devoted to music. The demands for gratuitous lecturers have somewhat decreased, while there has been an improvement in the employment of professional lecturers. Attention is called to the importance of having lectures delivered at regular and stated intervals, and in country places, where monthly lectures are alone practicable, it would be advisable to select an evening near the period of the moon being full, as light on a winter's night has a considerable influence on many persons undertaking a walk of any distance. In some Institutes the plan has been successfully adopted of canvassing the inhabitants generally to take season tickets for admission to a course of lectures, and the result has been not only to secure the committee against any risk of over expenditure, but also to induce many thus introduced to the Institute to become subscribers for its other advantages. The reading-rooms of the several Institutes are maintained in their efficiency. In some instances the cheerless appearance of the reading-room has operated to deter many from joining the Institute, whereas if it had combined warmth and light, with interesting publications for perusal, and such appearances of comfort as may be found elsewhere, it would be found a most valuable aid in exciting desire for mental improvement. With regard to the Examinations instituted by the Society of Arts, it is important, in order to render the system fully available, that the instruction in the classes of the Institute should have especial reference to the future examination. By this means the pupils would be in a better state of pre-

paration than by desultory efforts of their own. The success of the evening classes might be considerably promoted by the adoption of the system of Elementary Examinations which has been established by the Society of Arts. It not only forms an excellent preparation for the more advanced studies, but it affords encouragement at a period when encouragement is perhaps the most needed to stimulate the young to continue the education commenced in the day-school by attendance at the evening classes of the Institute. The elementary certificate, as the reward for the earliest efforts in mental cultivation, may often prove the most effectual stimulus to further efforts in the same direction. It has, moreover, the additional advantage of simplifying the Preliminary Examinations, which are indispensable in returning candidates for the Final Examinations of the Society of Arts. The system has thus far made very favourable progress.

PHOTOMETRIC BALANCE.

An apparatus for weighing the photometric standard candle has been designed by Mr. T. W. Keates, F.C.S., with the view of obviating the inconvenience, and in some measure the difficulty, of weighing the standard candle in experiments with Bunsen's photometer. The value of any means by which regular combustion of the candle in photometrical experiment can be secured is scarcely to be overrated. This is the element most easily disturbed in such experiments, and it is also that which is of the greatest relative importance, inasmuch as the candle is the standard of reference, and any irregularity in the manner of its burning necessarily affects the final results to a serious extent, especially when, as is often the practice, the experiment is only continued for a few minutes. Under all circumstances, however, it is essential that the burning of the candle should be rendered as regular as possible, and that the candle should be undisturbed and its burning uninterrupted after it has been weighed. These conditions cannot be fulfilled if the candle has to be lighted after weighing, nor if it has to be transferred whilst burning from the balance to the photometer. These difficulties the apparatus in question is intended to obviate. It consists in a particular arrangement of balance adapted to the beam of Bunsen's photometer at the end which supports the candle, and it is so contrived that it can be applied to any photometer of this construction. By reference to the woodcut it will be perceived that the candle at the moment of weighing takes the situation which it occupies during the photometrical experiment, and that the act of weighing is performed in such a manner that it does not influence in the slightest way the state of the flame; indeed, after the candle has reached its regular rate of combustion, it is not touched until the experiment including the second weighing of the candle is completed.

The balance employed in this apparatus, as it is shown in the drawing, is constructed with arms of unequal length—the distal arm, or that farthest from the candle, being twice as long as the other; the only object of this is the reduction of the weight of the counterpoise, which can thus be made of half the weight that would be required if the arms of the balance were of equal length. This not only facilitates the use of the instrument, but it diminishes the total weight upon the centre knife-edges.

REFERENCES TO THE WOODCUT.

A A. Balance-beam, with arms of unequal length.

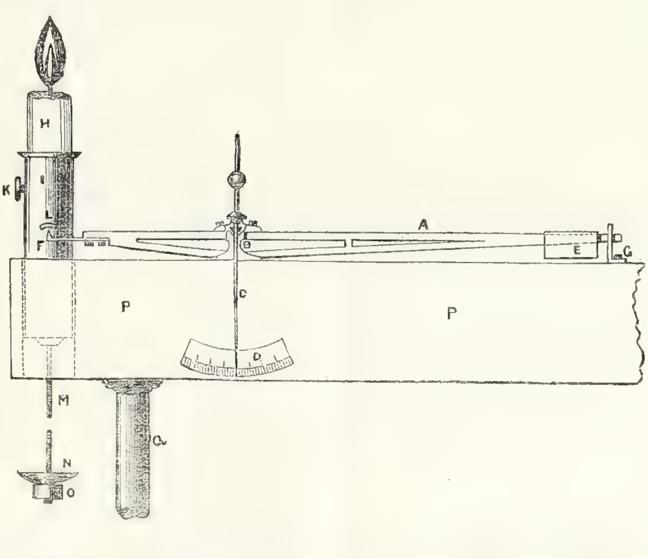
B. Support for centre knife-edges.

C. Index, with scale D.

E. Shifting saddle-shaped weight or counterpoise.

F. Knife-edge at extremity.

G. Rest for balance during the experiment.



H. Candle.

I. Case for candle.

K. Screw to adjust e height of the candle.

L. Steel projections, by which the candle-case is suspended on knife-edges.

M. Brass rod, to which is attached the small scale-pan, N, and the balance-weight, O.

P P. Portion of the end of the photometer-balance.

Q. Support to ditto.

In the drawing, the balance is shown in the position which it, and consequently the candle, would occupy during the photometrical experiment, with the trifling exception that the candle is one-tenth of an inch too low, as in the practical form of the instrument there is a contrivance for lifting the candle-holder off the knife-edges so soon as the weight of the candle is ascertained; this is done by a rack and pinion arrangement, which raises the candle-holder one-tenth of an inch, and holds it firmly whilst the power of the light is being estimated. Afterwards, the candle-holder is lowered again upon the knife-edges for the second weighing.

The manner of using this instrument is very simple. A few minutes before commencing the photometrical experiment, the candle, being placed to the proper height in the candle-holder, and fixed by the small screw, should be lighted and allowed to burn quietly until the flame has arrived at what may be termed, with reference to the photometer, its normal condition; this being so, the shifting counterpoise must be gently pushed along the balance-beam a little towards the centre, so as to allow the candle to carry down its end of the balance. Attention must now be given to the instrument for a short time. As the sperm is consumed and the candle becomes lighter, equilibrium will be restored to the balance, and the candle will very gently and gradually rise, so that the index of the balance will be brought to zero of the scale. At that moment the exact time by the clock must be observed, as this is the starting-point of the experiment so far as the consumption of sperm is concerned. The candle-holder

must next be raised very gently off the knife-edges, when the photometrical estimations can be carried on as long as may be required. When these are terminated, it only remains to make the second weighing of the candle. For this purpose the candle is extinguished carefully, and as quickly as possible, and the time which has elapsed between the moment at which the index of the balance pointed at zero of the scale and that at which the candle was extinguished, noted. The candle-holder is now again lowered upon the knife edges of the balance, and weights are placed in the small scale-pan hanging below the candle holder until the balance once more turns. These weights represent exactly the quantity of sperm consumed during the burning of the candle, the hour's consumption being, of course, a question of proportion.

Fine Arts.

The Frescoes in the House of Lords.—The Royal Commissioners appointed to consider the agreements made by the Fine Arts Commission with artists, in respect of the wall-paintings to be executed for the Palace of Westminster, have issued their report. They state that Mr. Herbert, in April, 1849, accepted the commission to paint nine of the pictures, which were to be completed in ten years, and for these he was to be paid £9,000. At the end of fifteen years only one of these subjects—"Moses Bringing Down the Tables of the Law"—is nearly finished, and three of the designs for the others have been submitted to the commission. Mr. Herbert has received £2,000 on account of the painting, and £1,800 on account of the designs. The commissioners recommend that a further sum of £3,000, in addition to the £2,000 already paid, be awarded to him, on account of the painting which he has completed; and they express the opinion that the contract, as regards the remaining eight pictures, should be cancelled, or, should it be determined that the other eight pictures be proceeded with, a new and more definite agreement should be entered into. As regards Mr. Maclise's pictures for the Royal Gallery, the agreement was for 18 subjects of various sizes. For the two largest the artist was to receive £3,500 each, and for each of the others say £1,000. One of the large ones, "The Meeting of Wellington and Blucher at Waterloo," is finished, and Mr. Maclise has received for it the stipulated price of £3,500. The second large picture is in an advanced state, and on account of it the artist has been paid one-half of the sum agreed upon, or £1,750. It is anticipated that these two works will be finished in about eight years from the time they were commenced. The commissioners compliment Mr. Maclise on the diligence and energy he has shown, and the sacrifice he has made in foregoing his private commissions for the great works. They recommend that the sum paid for these works should be increased to £10,000—£5,000 for each picture—the balance of £1,500 to be paid on the first picture directly, and the remainder on the completion of the other subject. As regards the other subjects, the agreement to be cancelled; or, if so determined, a fresh engagement might be entered into with the artist. The pictures for the Peers' Corridor and for the Commons' Corridor, by Messrs. Cope and Ward, are in a more advanced state. Mr. Cope has finished six, and Mr. Ward five, of the eight subjects which each gentleman undertook. It is recommended that they should be requested to complete their commissions with all reasonable despatch, and that £100 extra on the stipulated price for each piecture should be awarded to each artist. Of the seven compartments in the Queen's Robing room, as well as the twenty-eight smaller compartments in the same chamber which the late Mr. Dyce undertook, five of the seven large subjects were completed when he died. £5,600 had been paid to him; and the commissioners, in mentioning his premature death, consider that no interference or recommendation is necessary on this point. The report closes with the expression of a desire that in future there should not be any subsequent departure from any similar contract which may be deliberately agreed upon.

Austrian Art Association.—Vienna presents us with a very remarkable programme of an Art Exhibition, organised by the Austrian Artistic Association, of which rumour says the Duke of Saxe Coburg is the chief promoter. The Exhibition of this society is to be permanent, and, with certain exceptions, the works are to be changed once a month. Artists are required to send their works in only a week previously, but they must be examined and approved by the council of admission. A novel item in the regulations is, that artists are not required to send frames, the association announcing that it is provided in this respect for pictures of all sizes. The authorities have arranged that all cases addressed to the association shall pass the frontier and the douane without being opened, and the society pays the carriage both ways of all works sent after written invitation by artists abroad. Further, the directors of the Exhibition undertake the sale of works exhibited for 5 per cent. commission. An agency will shortly be opened in Paris, and there is no doubt that many French artists will gladly avail themselves of this opportunity of making their works known to the public of the Austrian capital.

Manufactures.

Bismuth from Old Type.—M. Balard, of Paris, has, in consequence of the high price of bismuth, tried the experiment of recovering it from old type metal, and he thus explains his mode of procedure:—1st. Dissolve in nitric acid, in order to transform all the tin into metastannic acid, which is separated from the solution by filtration from the nitrates of lead and bismuth; it is then washed in water slightly acidulated, dried, and reduced with charcoal. 2nd. In the liquid, neutralised to the utmost extent, strips of lead are plunged, which precipitate the bismuth in the metallic state; this is then dried and melted in the ordinary way. 3rd. The lead is precipitated from the last liquid by means of carbonate of soda, and afterwards dried and melted. In order to obtain the sub-nitrate of bismuth in a state of great purity, it is only necessary to neutralise the liquid containing the soluble nitrates, and to dilute it with a large proportion of water free from carbonates, chlorates and sulphates. In repeating these operations the greater part of the contained bismuth may be separated in the form of white oxide.

Printing without Ink.—M. Leboyer, a printer of Riom, in the Puy de Dôme, has recently patented a new system of printing, in which the printing ink is replaced by black paper, prepared with glycerine and lampblack. The carbonized paper is extended over two cylinders, and is shifted at each impression so that the pressure of the types may not fall too often on the same parts. The black paper remains always slightly moist, and may be used two, three, or more times. The convenience of such a system, provided the result be satisfactory, is self-evident, and it is quite possible that it may be applicable for address cards—to which M. Leboyer has specially applied it—and to some other applications of the same kind. Whether it can ever supersede ink for general purposes is a more difficult question to resolve.

Sulphate of Soda from Common Salt.—M. E. F. Anthon, of Prague, has announced a new method of extracting sulphate of soda from marine salt, by means of gypsum or sulphate of lime. The theory of his process is thus explained:—The carbonate of magnesia is decomposed by the gypsum forming on the one hand sulphate of magnesia, and, on the other, carbonate of lime, the salt in the water being transformed by the sulphate of magnesia into sulphate of soda, while the sulphate of magnesia is itself converted into chloride of magnesium. The

following is M. Anthon's mode of operation:—Take an equivalent of marine salt, of gypsum, and of calcined magnesia, and mix therewith water equal in weight to six or eight times that of the marine salt, then, while the mixture is kept in a state of continual agitation, introduce a current of carbonic acid gas until all the magnesia is thoroughly saturated; the solution is then poured off from the carbonate of lime, which is formed by the operation, and evaporated in order to separate by means of crystallization the sulphate of soda, and the chloride of magnesium remains in the mother water. The decomposition of the mixture given above is said to take three or four hours at an ordinary temperature. M. Anthon recommends, amongst other modes, for the preparation of the calcined magnesia, the use of magnesia precipitated by lime from salt water.

Commerce.

The Nitre Beds of Tacunga, Ecuador.—Last week, M. Boussingault communicated to the Academy of Sciences a paper on the nitre beds of Tacunga, in the state of Ecuador. Nitre, or saltpetre, is a substance formed by nature in astonishing abundance; it is to be met with in rain, snow, hail, and fogs; in the water of rivers, and consequently also in the ocean. It is produced in the air and in various soils; but, though found everywhere, it is seldom found in large quantities; the only spot on the globe where it is met with in this shape is Zarapaca, in Peru. Elsewhere this salt makes its appearance spontaneously, producing efflorescences on the surface not unlike vegetation. One day the soil is black and damp; the next is white and crumbles into dust. The saltpetre is collected by sweeping the surface, and if the weather continues fine, a new crop soon appears. It is thus obtained on the banks of the Ganges after an inundation; in Spain they obtain it by lixiviating vegetable mould, which may therefore serve the double purpose of a profitable nitre-bed or a rich corn-field. Tacunga is a town situated 59 minutes S. lat. and 80 deg. 10 min. W. long. from Paris; it was built in 1524, on the site of an Indian city; its altitude is 2,860 metres, its mean temperature 15 deg. centigrade. It lies between two rivers, the Alaque and the Cutushee, and at the base of the Cotopaxi. Its soils rests on a bed of trachyte and volcanic tufa, and consists of fine sand containing particles of trachyte and pumice-stone. The saltpetre effloresces on its surface, and is collected as above described. A kilogramme of dry earth produces 18 per cent. of nitre, independently of nearly $2\frac{1}{2}$ per cent. of nitrogen combined with organic substances. Efflorescence of saltpetre denotes an extremely fertile soil; indeed M. Boussingault considers fertility and nitrification to be intimately connected; the latter, however, depends in a great measure upon certain atmospherical conditions; thus, dry weather favours it; but damp, and especially rain, will dissolve and wash away the nitre already formed.

Railway Traffic.—The annual return from the Board of Trade concerning the railways of the United Kingdom exhibits in nearly every category a uniform increase for 1863 on the same statistics for 1862, whether it be in mileage, passenger traffic, goods traffic, or the several items of income and expenditure. Last year 173,605,485 passengers travelled on the railways in England and Wales, which, taking the population at something under 22,000,000, would give an average of say eight journeys for each individual. On the 31st of December, 1863, there were in all 8,568 miles of way open, over which 3,811,878 trains ran, carrying 173,605,485 passengers of all classes, exclusive of those who held season tickets, of whom there were 42,991. In connection with the passengers, there were carried at the same time 55,242 carriages, 226,439 horses, and 327,147 dogs. The goods traffic shows the following results:—There were carried 39,737,074 tons of coal and coke, and of all minerals 55,613,641 tons; of general merchandise, 26,471,928 tons; while 2,123,833 cattle, 6,076,908 sheep, and 1,270,561 pigs were also carried. The passenger trains travelled over 50,515,081 miles, while the entire distance travelled by all trains was 97,424,179 miles. The money received for the passenger traffic was £12,262,416; and for the goods traffic, £13,950,406; making the total receipts from all sources of traffic, £26,212,822. It is an important point to consider how this wonderful system of traffic has been performed in respect of safety. Of the 3,811,878 trains, 51 met with accidents; 44 of the accidents were to passenger trains; and of the 173,605,485 passengers, 11 were killed and 371 injured. The total number of passengers, servants, and others who suffered by accidents to trains in 1863, to all railways in England and Wales, was, 18 killed and 402 injured. There were 129 people killed and 419 injured from every cause on railways, including trespassers and people killed or injured at crossings. The amount paid as compensation for personal injury was £130,794. These are the general statistics, which may be divided into a more particular form. On the London and North-Western 19,185,751 persons travelled, exclusive of 5,372 season-ticket holders; there were 17 accidents, when two passengers were killed and 69 injured; £20,000 was paid as compensation for personal injury, &c. The receipts from passenger traffic were £2,365,322; from goods traffic £2,914,937; the proportion per cent. of expenditure to total receipts was 46, and the net receipts £2,866,849. The Great-Western carried 17,291,221 passengers, besides 1,975 holders of season tickets. There were seven accidents. One passenger was killed from his own misconduct, and 37 were injured from causes beyond their own control. This company paid £2,176 as compensation for personal injuries. The receipts were:—From passengers, £1,799,462; from goods, £1,666,196. The proportion of expenditure to receipts was 48 per cent., leaving a profit of £1,793,492. There were 11,011,661 passengers on the Great-Eastern line. Four accidents took place, by which seven passengers were killed and 33 received injuries, which cost the company £8,824 for personal compensation. £777,920 was received on account of passengers; £719,485 from goods; the working expense was 52 per cent., and the net income £719,903. The Great Northern had 6,003,515 passengers. There were seven accidents, whereby one passenger was killed and 18 injured. The per-centage for working on this line was 50, and the total gross income £1,594,169; the net income £791,182. These returns will serve as examples of the great metropolitan lines; but the following particulars are subjoined to illustrate the working of the purely provincial undertakings:—The Lancashire and Yorkshire lines carried, during 1863, as many as 16,210,097 passengers, from whom an income of £741,107 was obtained, while the goods traffic yielded £1,037,154, making a total gross income of £1,778,261. The proportion per cent. of expenditure to total receipts was 47, and the net profits £947,479. There were three accidents, by which 21 passengers were injured, but none fatally. This company paid £8,351 as compensation for personal injury.

Railway Working Expenses.—The total working expenses of the railways in England and Wales in 1863 amounted to £12,659,618, against £12,050,581, in 1862; of the railways of Scotland to £1,617,204, against £1,520,056 in 1862; and of the railways of Ireland to £750,412, against £697,772 in 1862. The aggregate for the United Kingdom was thus £15,027,234 in 1863, against £14,268,409 in 1862. The length of line in operation at the close of 1863 was 12,322 miles, and at the close of 1862, 11,551 miles. The totals given do not include steamboat, canal, and harbour expenses; and the figures in 1863 are also exclusive of the working charges of the Oswestry and Newtown, Cowes and Newport, Brecon and Merthr Tydfil Junction, Cork and Kinsale Junction, Dowlais, and Hereford, Hay, and Brecon. The proportion of expenses to receipts appears to have been reduced

last year to 48 per cent., against 49 per cent. in 1862. The working expenses of last year may be analysed as follows:—Maintenance of way and works, 18·95 per cent., against 18·99 per cent. in 1862; locomotive power, 27·62 per cent., against 27·79 per cent. in 1862; repairs and renewals of carriages and waggons, 9·33 per cent., against 8·71 per cent. in 1862; traffic charges (coaching and merchandise), 27·92 per cent., against 27·95 per cent. in 1862; rates and taxes, 4·20 per cent., against 4·18 per cent. in 1862; government duty, 2·63 per cent., against 2·63 per cent. in 1862; compensation for personal injury, &c., 1·19 per cent., against 1·11 per cent. in 1862; compensation for damage and loss of goods, 0·46 per cent., against 0·48 per cent. in 1862; legal and parliamentary expenses, 1·30 per cent., against 1·54 per cent. in 1862; and miscellaneous, 6·40 per cent., against 6·62 per cent. in 1862.

Colonies.

Progress in Adelaide.—The treasurer's financial statement shows, in a cheering manner, the high state of prosperity which the colony enjoys at present. Never had a South Australian treasurer such a favourable report to present of the real material progress of the colony. On the 31st of March the population consisted of 141,563 souls, and it was estimated that at the close of this month, by natural increase and by emigration, there would be a population of 143,126. The gross total exports for the year ending 31st March, 1864, amounted in value to £2,738,226, being an increase over those of the previous year, up to the same date, of £473,120, or nearly 21 per cent. The staple productions of the colony are cereals, wool, and copper, and the amount of export of those articles is most encouraging. From the 31st March, 1863, to the same date 1864, the value of cereals exported was £1,011,989, being an increase over the preceding year of £307,511. But taking the half-year ending March, 1864, as compared with the corresponding period in 1863, the increase is still greater. For the six months in the former year the exports of cereals amounted to £373,247, while for the six months in this year they were £595,181. By the time the surplus cereals of the present year which can be spared for export are disposed of it is estimated that their value will amount to £1,310,000. This large amount arises from two causes—first, from the favourable yield of the last harvest, and secondly from the high prices prevailing. The serious failure of the crops in the other colonies has caused a large demand for our cereals, and thus large prices have been obtained. To show the importance of South Australia as a wheat-producing country, as compared with other wheat growing lands, the treasurer states that in California there were 263,208 acres sown, which produced 4,147,649 bushels, while in South Australia 335,758 acres gave 4,691,918 bushels. The population of California is 380,000, while that of this colony is something over 140,000. California, then, with nearly three times the population of South Australia, produced a less quantity of wheat; and her requirements for her own population being nearly three times as great as those of this colony, her surplus available for export will be proportionately less. If these figures are correct we do not think that our wheat-growers need be under very serious apprehensions that California will drive them out of the markets of the neighbouring colonies. The export of wool for the year ending March 31, was £770,835, against £682,991 for the previous year, or an increase of nearly £90,000. The export of copper had still more largely increased, showing £595,303 as compared with £321,736 the preceding year. The imports for the year ending 31st March, 1863, were in value £1,842,734, in 1864 they were £206,244, an increase of 12 per cent. The quantity of land disposed of in this colony is 2,750,000 acres, or an average of nearly 20 acres to each head of the population. In Victoria the proportion was under nine acres. In Victoria the cultivated area gives only four-fifths of an acre to each individual, whilst in this colony it gives nearly four acres. Vine-growing has become an important branch of our industry, and we find that during last year there were 5,779 acres laid down in vineyards, being an increase of one-fourth on the previous year. The vintage of 1863 yielded 606,365 gallons, showing an increase of 133,538 gallons on the former year.

Tasmania.—The total customs' duties collected during the eleven months from July 1, 1864, to May 31, 1864, were—at Hobart Town, £66,042 7s. 3d.; and at Launceston, £62,575 2s. 5d., together £128,617 9s. 8d. Of this amount £13,615 6s. 4d. was for measurement duty, £7,917 8s. 10d. having been collected at Hobart Town, and £5,697 17s. 6d. at Launceston. Supposing the revenue of the current month to be the average of the previous eleven months, say £11,500, it will give the customs' revenue for the year ending 30th June, in round numbers, £140,000. Ministers expected to get £135,000. The revenue yielded by the Stamp Act cannot be accurately ascertained, as postage stamps have been generally employed. During the quarter ending 30th September, 1863, the sale of stamps showed a decrease, but the Stamp Act came into force on the 1st of October, and at 31st December, 1863, there was an increase of £341 3s. 9d, and for the quarter ending 31st March an increase of £1,115 4s. 5d. If the increase on the last two quarters is ascribed to the operation of this Act, we may set down the revenue it will have furnished at the end of the present month at £2,000, or about £3,000 per annum. The Carriage Duties Act came into force on the 15th October, 1863, and to 31st December it yielded £1,336, during the quarter ending 31st March £304, and for April and May £144, altogether £1,728. If continued for twelve months it would probably yield £1,900—ministers calculated upon £1,750. In noticing the Land Fund, it is only necessary to say that the quarter ending 31st September last manifests an increase of £2,836 9s. 7d. over the corresponding period of 1862—the quarter ending 31st December shows a decrease of £2523 5s. 3d., and the March quarter of the present year shows an increase of £15,527 8s. 9d. The latter large augmentation arose on the sale of land taken up under the old prescriptive right regulations, and payment for which in the beginning of the present year, or forfeiture, was required by an act passed last session. On the whole, the revenue appears to have been pretty well sustained by the numerous and novel expedients adopted for the purpose. It remains to be seen whether the expenditure has been watched as narrowly, and whether the statements which the treasurer is expected to make will prove acceptable to parliament and the country.

Publications Issued.

Map of Africa During the Roman Domination.—(*Dumaine*, Paris.) The topographical department of the Ministry of War, having completed the map of France, upon which it has been almost exclusively occupied for thirty years, this important *bureau* has been re-organised, and a series of new and important works commenced. Amongst the first fruits is a recently-published map of Africa during the time of the Romans, printed in fine colours, on two large sheets, and accompanied by an explanatory notice or key. The map takes in all that portion of Africa which lies between Morocco and Egypt, and between the Mediterranean and the 27th degree of latitude; and we are assured that the director of the work, Captain Nau de Champlouis, has availed himself of the most recent and authentic information. The physical configuration of the country is indicated with great care, and this is made the basis of the historical geography of the locality. The great object of the map in question is to give Africa as it was under the Romans as compared with

the results of modern geography. With this view the ancient and modern names of places are given side by side, and distinguished by different colours, and a list of the Latin names is appended, with references to the localities which they represent on the map. One difficulty in the work was the fixing a certain date to that which related to the Roman period. M. De Champlouis has therefore taken the administrative divisions as established by Caligula for his basis, and has placed four tables in the angles of the maps to indicate the progress of the Roman domination during the course of its existence. The map has been presented to the Institut by Marshal Randon, and has obtained the commendation of that important body.

Metrical Globe.—M. E. Gosselin, of Paris, has introduced a new idea into the arrangement of globes. He has produced a globe which gives all the most recent discoveries, including those of MM. Speke and Grant, in Africa, and he has added an important feature, namely, the giving to the surface of the artificial globe a certain proportion in relation to the earth itself. The base adopted is the metrical system, and the scale one in 50,000,000, so that the circumference of the globe being 80 centimetres two millimetres represent 100 kilometres. In calculating distances, therefore, it is only necessary to take the actual measurements on this artificial globe, write down the results, remove the decimal point five places to the right, divide by two, and you have an approximation to the actual distance on the surface of the earth. On this globe the aqueous portions are coloured blue, and the solid portions with a tint of bistre.

Notes.

Dublin International Exhibition, 1865.—An influential meeting was held on the 5th inst., at the Mansion House, Dublin, presided over by the Lord Mayor of that city, when the following committees of advice and assistance were appointed:—Lord Otho Fitzgerald, Earl of Rosse, F.R.S.; Sir R. Griffith, Bart.; Major-General Sir Thomas Larcom, K.C.B.; Sir Robert Shaw, Bart.; Vice-Provost Lloyd, Rev. T. Romney Robinson, William R. Le Fanu, Esq., C.E.; J. Tuffnell, Esq., M.D., F.R.C.S.I.; Richard Butcher, Esq., M.D., F.R.C.S.I.; George W. Hatchell, Esq., M.D., F.R.C.S.I.; B. B. Stoney, Esq., C.E.; R. C. Wade, Esq.: Francis Robinson, Esq., Mus. Doc.; J. F. Elrington, Esq., LL.D. Army.—Section No. 8.—Viscount Gough, K.P., G.C.B., P.C., K.S.I.; General Key, Colonel Wetherall, C.B.; Colonel Whitmore. Navy.—Section No. 8.—Sir James Dombrain, Captain De Courcy, R.N.; Captain Wilcox, R.N., *Machinery.*—This class includes machines for direct use, carriages and railway and naval mechanism; manufacturing machines and tools; civil engineering, architectural, and building contrivances; naval architecture and military engineering, ordnance, armour, and accoutrements; agricultural and horticultural machines and implements; philosophical instruments and processes depending upon their use; photographic apparatus; musical, horological, and surgical instruments; machinery employed in spinning and weaving, and in the manufacture of wood and metal, &c.—David M'Birney, Esq., J.P.; C. P. Cotton, Esq., C.E.; J. Lentaigne, Esq., D.L.; J. West, Esq., J.P.; Hon. G. Handcock, Viscount Dunlo, J. E. Vernon, Esq., D.L.; John Vance, Esq., M.P.; the Earl of Howth, Anthony Lefroy, Esq., M.P.; Ion T. Hamilton, Esq., M.P.; Hon. St. John Butler, Right Hon. the Attorney-General for Ireland, Lord St. Lawrence, the Earl of Meath, Charles E. Bagot, Esq., Percy Fitzgerald, Esq., *Metallic, Vitreous, and Ceramic Manufactures.*—This class embraces cutlery and edge tools; iron and general hardware; working in precious metals and in their imitation; jewellery, and all articles of virtu and luxury, not included in the other classes; glass; ceramic manufacture, china, porcelain, earthenware, &c. *Miscellaneous Manufactures.*—H. Fry, Esq.; Sir Robert Kane, F.R.S.; James Forrest, Esq.; Sir R. Griffith, Bart.; A. H. Bagot, Esq.; Right Hon. the Lord Mayor; R. G. Collis, Esq.; Alderman Atkinson, J.P.; Arthur Guinness, Esq.; Hugh Brown, Esq.; Sir Robert Shaw, Bart.; Samuel Law, Esq., Governor, Bank of Ireland; Lord Viscount Southwell; John Hatchell, Esq.; Solicitor-General; John Henry Richards, Esq.; Arthur Usher, Esq.; J. Pim, Esq. *Fine Arts.*—The Lord Chancellor, Lord Talbot de Malahide, F.R.S., F.S.A., F.G.S., D.L.P.; Marquis of Kildare, Marquis of Drogheda, Viscount Powerscourt, Lord Cloncurry, Judge Berwick, Sir Bernard Burke, Sir J. J. Coghill, Bart, J. E. V. Vernon, Esq., D.L.; C. Smith, Esq., P.R.H.A.; George F. Mulvany, Esq., R.H.A.; Thomas A. Jones, Esq., R.H.A.; J. R. Kirk, Esq., R.H.A.; M. A. Hayes, Esq., R.H.A.; General Colomb, William M'Kay, Esq., LL.D.; Jacob Owen, Esq.; Francis R. Davies, Esq.; S. C. Hall, Esq.; Right Hon. Alexander M'Donnell, Earl of Charlemont, Sir Thos. Dean, Sir John Benson, Sir George Hodson, Bart. Mr. Parkinson (Secretary to the Exhibition Committee) said that the result of the circulars sent out had been most satisfactory. The refusals had been few and far between. The meeting was addressed by Mr. B. L. Guinness, the Earl of Meath, Lord Powerscourt, Mr. Gilbert Saunders (Chairman of the Executive Committee) Mr. Wm. Dargan, Sir George Hodson, Sir Bernard Burke, and others.

North London Working Men's Exhibition.—On Wednesday evening, the 17th of August, a meeting was held in Amwell-street schoolrooms, Clerkenwell, for the purpose of promoting an industrial exhibition similar to that held last winter in Lambeth, for the large and important industrial district comprised in that portion of North London covered by Clerkenwell, Islington, St. Luke's, Hoxton, Holborn, and St. Pancras. Mr. Thomas Winkworth, member of the Council of the Society of Arts, occupied the chair, and after giving a condensed history of the exhibitions held in this country under the auspices of the Society, with the late Prince Consort at its head, went on to say that in those exhibitions the skilled artisan was to a great extent practically ignored, inasmuch as the persons invited to exhibit were generally employers of labour, and not workmen. Hence the masters took the lion's share of the honour; but then it must not be forgotten that they found the capital and ran the risk. To obviate this apparent unfairness the Society of Arts determined to follow out its original idea of encouraging the talent of the workman, and offered prizes to artisans willing to compete in various important branches of skilled industry. The Lambeth Exhibition on this principle had been held last year, and he hoped to see the same thing repeated in North London. After other remarks, made for the encouragement of the intending exhibitors, explanations of the details of the proposed exhibition were given by the hon. secretary, Mr. Watts, by Mr. Wm. Harvey, and other gentlemen. The exhibition is to be held in October next, in the Islington Agricultural Hall, and the exhibitors are to be working men and women and small masters. Resolutions approving the exhibition were agreed to, and the meeting separated.

Mining in France.—A report on the number of concessions granted for the working of mineral deposits in France shows that this branch of industry is progressing rapidly. It appears that there exist in force 490 grants for the working of coal, covering in all a superficial area of 5,226 kilomètres, spread over the following departments:—Loire, Gard, Aveyron, Isère, Hérault, Saône-et-Loire, Basses Alpes, Nord, Bouches-du-Rhône, Hautes-Alpes, Allier, Pas-de-Calais, Mayenne, Maine-et-Loire, Haute-Loire, Haute-Saône, Var, Puy-de-Dôme, Moselle, Ardèche, Sarthe, Bas-Rhin, Vaucluse, Aude, Creuse, Cantal, Vendée, Vosges, Corrèze, Rhône, Ain, Loire-Inférieure, Drôme, Tarn, Dordogne, Jura, Finistére

Landes, Calvados, Nièvre, Manche, Yonne, Deux-Sèvres, Doubs, Hautes-Pyrénées, and Pyrénées-Orientales. The kilomètres is rather more than three-fifths of a mile, English. The iron mines opened are given at 124,382 hectares, or, in round numbers, 300,000 acres English. divided amongst the following departments:—Isère, Pyrénées Orientales, Gard, Moselle, Saône-et-Loire, Ardèche, Aude, Aveyron, Doubs, Loire, Ain, Manche, Nord, Hérault, Jura, Haut-Rhin, Basses-Pyrénées, Vosges Saône-et-Loire, Ariége, Bas-Rhin, Côte-d'Or, Corse, Var, Creuze, Corrèze, Vaucluse, Puy-de-Dôme, Drôme, and Haute-Marne. Besides the permissions or concessions for coal and iron mining, there are 247 in force for other minerals, including graphite, bitumen, pyrites, salt springs, rock-salt, antimony, manganese, and other metals and sulphur.

Agriculture in France and England.—The reports which have appeared in connection with agricultural exhibitions exhibit French agriculture as falling far short of perfection. It appears by the returns of the statistical department of the Minister of Agriculture that the average yield of wheat in France is just half of that of England; the department of the Seine, which exhibits the highest cultivation, produces but 25·72 hectolitres per hectare, while the general average of France is 13·64, and that of England 27 hectolitres; 43 departments yield far less than the average. 9 of them only 8·17. The fact of the minute subdivision of the land having a constant tendency to produce a low condition of farming is admitted on all hands—a poor farmer always farms badly—but it is taken for granted that no change in the national habit can be made in that respect. As regards drainage, it appears that with all the aids afforded by the Government only 145,000 hectares have been drained, although the profit derived from the operation is calculated at 20 per cent. on the outlay.

Flax.—An unusually large breadth of land is this year under flax cultivation in Ireland, and there is every prospect of a good crop. The accounts from the Continent are also more favourable than last month, but generally the crops there will fall short of those of 1863.

Church Towers.—The tower of Strasburg Cathedral has heretofore been considered the highest in Europe, and that of Saint-Etienne, in Vienna, the next in altitude, the former being 449 and the latter 439 feet high. The tower of the latter edifice is now being rebuilt, and when finished will o'ertop that of the former by five feet.

Locomotives.—The number of locomotives owned by the railway companies of the United Kingdom at the close of the year 1863 was 6,643. At the close of 1862 the corresponding number was 6,398.

Patents.

From Commissioners of Patents Journal, August 19th.

Grants of Provisional Protection.

Anchors, construction of—1830—E. Snell and G. Allibon.
Boats, construction and propulsion of—1965—S. L. Cousins.
Bottles and jars, envelopes or covers for—1880—E. Brimson.
Buttons, manufacture of covered—1898—G. A. Huddart.
Cane, machinery for preparing 1943—A. Guthrie and T. Tracey.
Carriage steps (folding)—1985—J. Grice, jun.
Casks for liquids—1955—W. R. Taylor.
Caster—1969—W. E. Gedge.
Cocks for supplying water—1971—L. Young.
Cornets and other musical wind instruments—1896—H. J. Distin.
Cotton, wool, &c., pressing and packing—1947—F. Thornton.
Crinolines—1918—C. Hochgesangt.
Dyeing and printing, green colouring matters for—1913—H. Carter.
Electric telegraphs—1973—P. A. J. Dujardin.
Fabrics, apparatus for coating with medical or other compounds—1916—F. D. Delf.
Fibrous materials, machinery for breaking, scutching, &c.—1926—E. Brasier.
Fire-arms—1805—J. Syme.
Fire arms, breech-loading—1888—R. Redman and D. Kirkwood.
Fire-arms, breech-loading—1967—W. Collins and W. Pountney.
Fire-arms, &c.—1993—B. H. Mathew.
Foulardine (fabric)—1928—W. E. Gedge.
Furnace bars—1945—J. Gothard and H. Garland.
Furnaces—1892—E. B. Wilson and C. De Bergue.
Healds for weaving—1959—R. Edmondson.
Hydraulic cranes—1930—P. G. B. Westmacott.
Land, apparatus for cultivating—1991—R. Dannatt.
Metals, apparatus for making moulds for casting—1951—J. Heydon.
Placards, signals, &c., producing luminous—2001—R. A. Brooman.
Postage stamps, &c., apparatus for affixing—1914—H. T. Davis.
Potteryware glazes and enamels for—1920—J. H. Johnson.
Power looms—971—W. E. Gedge.
Printing type, manufacture of—1999—A. V. Newton.
Railways, securing rails on the permanent way of—1997—J. Lang.
Railway stations, sweeping the platforms of—1908—C. Eastwood.
Railway trains, communication between passengers and guards—1906—E. Tattersall.
Railway trains, communication between the guards and passengers—1820—W. Booth.
Railway trains, communication between the guards and passengers—1868—W. Dicey.
Railway trains, signalling on—1796—T. Wilson.
Reporting, type writing machine for—1983—J. Pratt.
Rivet holes, apparatus for rimming, &c.—1995—J. Russell.
Sails, apparatus for reefing or furling—1910—W. Pearson and W. Smallwood.
Sewing machines—1932—A. L. Wood.
Sewing machines—1934—C. Bolton.
Shipbuilding, &c., treatment of iron plates for—1963—N. McHaffie.
Ships of war, construction of—1961—C. P. Coles.
Ships, prevention of the fouling of the bottoms of—1941—F. Cruickshank.
Slide valves—1885—R. D. Sanders.
Spring tension regulator—1987—G. Haseltine.
Steam engines, packing and lubricating parts of—1912—H. Attwood.
Stone, machinery for driving drifts through—1904—F. E. B. Beaumont.

Inventions with Complete Specifications Filed.

Fluids, apparatus for pumping—1966—G. A. Nowell.
India-rubber, apparatus for cutting—1940—G. E. M. Gerard.
Pianofortes—1939—T. J. V. Roz.
Ploughing machines—2028—A. B. Childs.

From Commissioners of Patents Journal, August 23rd.

Patents Sealed.

451. T. J. Hughes.	527. G. Gaze.
452. J. Sanders, jun.	536. J. Crutchett.
455. J. H. Horsfall.	556. H. Cochrane.
458. W. Rowan.	609. H. E. Clifton.
460. A. Wall.	610. J. Shortridge and J. B. Howell.
462. L. A. Durrieu.	664. B. Day.
477. J. H. Johnson.	708. E. Borrows.
482. A. Prince.	725. W. Howe.
487. T. C. Barraclough.	851. W. Clark.
489. G. Birtwistle & R. Furnival.	1283. J. Fowler, jun.
494. H. Barwell.	1351. J. Fowler and T. Webb.
501. W. E. Gedge.	1420. W. E. Newton.
504. J. Chapman.	1565. J. D. Adams.
518. L. A. Laniel.	

Patents on which the Stamp Duty of £50 has been Paid.

2056. G. T. Selby.	2089. J. M. Murat.
2075. F. Gye.	2135. J. C. C. Azemar.
2117. J. Cranston.	2193. D. Ward.
2069. S. Whitaker & R. A. Jones.	2088. M. A. F. Mennons.
2065. W. Fitkin.	2148. S. Corbett.

Patents on which the Stamp Duty of £100 has been Paid.

2217. T. Ingram.	2223. H. Cartwright.
2224. J. Dauglish.	

Registered Designs.

Croquet stand—4644—W. Cordeaux and C. Ernest, York.
Fastening for a bracelet or catch for articles of jewellery—4645—Hermann Van Dicom, Black Lion-street, Brighton.
The Izaak Walton paragon winch fitting—4646—Geo. Jacobs, 32, Cockspur-street, S.W.
Feeding trough—4647—Jno. Webb, Hawkedon, Birmingham.
Self-oiling top centre plate for floor door springs—4648—Mathew Walters Wilkes and Co., Birmingham.
Gun or rifle rack—4649—William Talley, Bletchley, Bucks.
Shirt cuff (the Dane)—4650—Jno. Lyon Field, 28, Winchester-crescent, Chelsea.
A spring bottle holder—4651—Elkington and Co., Birmingham.
A combined music stand and table—4652—Fredk. W. Burton, 20, Somerset-place, Hoxton.
Whipple tree for ploughs—4653—Edmund Edmund, Rugby.
Attachment for the inside handles of carriage doors—4654—Josiah Adams, Birmingham.

THE

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AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, SEPTEMBER 2, 1864. [No. 615. VOL. XII.

TABLE OF CONTENTS.

Announcements by the Council.

EXAMINATIONS, 1865.

The Programme of Examinations for 1865 is now ready, and may be had gratis on application to the Secretary. A copy has been sent to each Institution and Local Board.

Proceedings of the Society.

EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 646.)

MINING AND METALLURGY.

THREE HOURS ALLOWED.

1. Describe the ordinary process of roasting lead ores in the reverberatory furnace, and the chemical changes which take place during the operation.
2. In what localities is tin ore principally found, and by what apparatus and in what way is it crushed and prepared for the market?
3. What is the principal ore of mercury, and how is quicksilver obtained therefrom?
4. How would you ascertain, commercially, the amount of copper present in an ordinary sample of copper pyrites?
5. Give the composition of iron pyrites, and state for what purposes it is chiefly employed in the arts.
6. From what source is the white arsenic of commerce (arsenious acid) principally derived?
7. Describe the ordinary round buddle for dressing ores.
8. How would you estimate, by assay, the amount of silver contained in an ore of copper?
9. Give, approximately, the composition of Welsh steam coal.
10. Describe the processes usually employed in this country for the conversion of wrought iron into steel.
11. If 900 cubic feet of water per minute be expended on an overshot wheel, 20 feet in diameter, with a 2-feet head, what will be its horse-power?
12. Describe the process of boring as employed in searching for coal and ironstone, &c.

POLITICAL AND SOCIAL ECONOMY.

THREE HOURS ALLOWED.

First Series to be answered, if possible, throughout.

1. Give a sketch of our Asiatic dependencies (exclusive of Australasia), showing the different products of each, and the principal trade of each with Great Britain.
2. What was the original character of the East India Company? How was that modified by successive acts of Parliament, and what is the Company now?
3. What are the proper uses of Bills of Exchange, and how do you distinguish *bonâ fide* commercial bills from those which are drawn for accommodation?
4. What are now the limits of the issues of the Bank of England, and what are the functions of the issue and banking departments respectively?
5. Show, by instances, the progress in the improvement of roads in England previous to the introduction of railroads? What are the different sorts of highways, and out of what funds are they repaired?
6. What is a drawback, and what a bounty upon exportation, and upon what different principles are they founded?

Second Series. Optional.

1. Under what circumstances, and for what purposes, are monopolies, either trading or professional, useful and right?
2. What questions are now at issue between those who propose and those who resist the equalisation of the Sugar duties?
3. To what special taxation, either in kind or degree, s the ownership and occupation of land now subject, and from what taxation is either of them either wholly or partially exempt?
4. How far is it true that all taxes on the produce or occupation of land are payable out of the rent?

DOMESTIC ECONOMY.

THREE HOURS ALLOWED.

1. Explain what you understand by Domestic Economy, and enumerate under different heads what, in your opinion, it embraces.
2. In domestic expenses what rules would you lay down:

   1st. As to rent.
   2nd. Food and clothing.
   3rd. Casual expenses.

3. What are the advantages, in purchasing the ordinary necessaries of life, in paying ready money, and what are the disadvantages in not doing so?
4. What are the relative advantages or disadvantages to the labouring classes, in the purchase of necessary things, to those living in large towns, and in rural parishes widely distant from them:

   1st. As to house rent.
   2nd. As to food and clothing.
   3rd. As to health.

5. What is the most economical mode of cooking meat? and why? How should a joint of meat be boiled in order to preserve the juices?

6. Compare the use of wheat-flour and oatmeal in different parts of Great Britain. How is this to be accounted for? Which of the two is the more nourishing? and why?

7. Are there any objections to using salted meat as an article of food?

8. Describe any method by which fuel may be economised. What principles should guide us in the choice of our clothing?

9. What kinds of food keep up animal warmth, supply the waste of muscle, and produce bone?

10. Explain how it is that hot water often breaks crockery?

11. In effecting an insurance on one's life, or in providing against sickness by entering a benefit club, what precautions should be taken, and what dangers should be guarded against?

12. What value do you attach to reading, writing, and arithmetic, as qualifications for good household management?

13. What are the leading principles of good management in the mother of a family in the labouring classes?

14. How are the health, happiness, and morality of the working man and his family affected by the circumstance of his having a commodious and fitting cottage to live in?

GEOGRAPHY.

THREE HOURS ALLOWED.

1. By what conditions are the eastern and western sides of Britain distinguished from one another—as to outline, character of surface, mineral produce, and climate?

2. In what counties are Kidderminster, Halifax, Stockport, Birkenhead, Pontypool, Stroud, Bridport, Dundee, Wick, Glasgow, Paisley, and Belfast? Name any distinguishing branches of industry connected with those places, respectively.

3. Describe briefly, as to natural features, political divisions, and chief towns, *one* of the following countries:—France, Italy, Prussia.

4. Draw up a list of the British colonies and dependencies throughout the world, under the respective headings of Europe, Asia, &c. Name the capital of each.

5. Write a brief account of Canada, as to its physical features, productions, industrial resources, and chief towns.

6. Give, similarly, a brief account of British Columbia and Vancouver Island. Say by what routes they are accessible from Britain.

7. Give a brief account of Australia, as a whole—with reference to situation, natural features, climate, and indigenous productions.

8. Write a brief description of New South Wales, stating particularly the respective characteristics of its maritime and inland divisions, the names and direction of its principal rivers, its mineral produce, and the leading conditions of its climate. Also, say what constitutes its principal article of export.

9. In which of the Australian colonies are, respectively, the towns of Bathurst, Brisbane, Sydney, Castlemaine, Geelong, Perth, Goulburn, Launceston, Hobart Town, and Adelaide?

10. Draw an outline map either of New South Wales or Victoria, marking on it the direction of the high grounds, the rivers, and the places of the principal towns.

11. What conditions, besides distance from the equator, tend to regulate climate, in so far, especially, as temperature is concerned? Illustrate this by some examples of contrasted climates, in the case of localities lying within the same (or nearly the same) parallels.

12. State some of the more striking points of difference between the flora and fauna of the Old and New Worlds. Also, some instances of the respective changes made by the agency of man between the one and the other (*i.e.*, instances of plants or animals transferred from the Old to the New World, or *vice versa.*)

(*To be continued.*)

Proceedings of Institutions.

EBBW VALE LITERARY AND SCIENTIFIC INSTITUTION.—The report for the year 1863-1864, read at the annual meeting of members, July 12th, 1864, under the chairmanship of the Rev. William Hughes, M.A., Vice-President, states that there has been a considerable increase in the number of subscribers, and the Institution is, in this respect, in a more flourishing condition; but it is equally evident that the number of members who avail themselves of its advantages is far from commensurate with the number of inhabitants in these works and the immediate neighbourhood. The essay prize scheme, established some three years since, and to which many persons not only in the place but the vicinity handsomely contributed, has failed to excite the interest or exercise the intellect of the members this year. Although first and second prizes of £3 and £1 10s. were offered for successful essays on each of two subjects, both in English and Welsh, and amounting in the aggregate to £18, only one composition in each language has been sent in. The English adjudicator, the Rev. Evan Lewis, M.A., Vicar of Aberdare, reports the essay on "Self-dependence," marked "Truth," and which has been ascertained to be the production of Mr. Jabez Wall, to be worthy a prize. It is with regret the Committee announce that there has not been any attempt at the formation of classes during the past year. The museum, which has attracted many visitors, has had but few acquisitions, but, at the same time, has not drawn upon the funds of the society. The only novel features which have characterised this year's transactions, are the introduction of penny readings, and the substitution of a pic-nic for the annual soirée. The former were tried, as an experiment, on the anniversary of the Shakspeare Tercentenary, when several interesting selections from good authors were read, and the proceedings were enlivened by the performance of glees and duets from his works. This proved most successful, and the Committee would strongly recommend that a series of these entertainments should form part of the programme for the ensuing year. The pic-nic also was a very satisfactory affair, many hundreds enjoying the journey to Caerphilly Castle—and the scene, the refreshments, and the amusements there provided. It is proposed this year to repeat the entertainment, varying only the scene, and arrangements are in progress for a trip to Raglan Castle at an early opportunity. The number of books in the library (as per catalogue) is 1801. They are in good repair with the exception of about twenty, which require re-binding. The attention of the Committee has long been directed to a revision of the books, and the formation of a new and comprehensive catalogue; and they especially call the attention of their successors in office to this much desired object. During the past year 168 volumes have been added to the shelves; of these two volumes have been presented; 136 have been purchased by the society; and the remaining 41 consist of the best of the periodicals, which have been rebound and added to the general list. In addition the Committee have purchased for the reading-room maps of the seats of war in Denmark and America, and beg to throw out a suggestion that the walls of the room might be appropriately and usefully hung with some good and large maps out of the gratifying balance in favour of the Institution. A good clock also would be a desirable addition to the reading-room. The Committee beg gratefully to acknowledge their obligations to the Ebbw Vale Company for their continued munificence.

GAOL DIETARY—THE OPERATIONS OF THE RECENT COMMITTEES.

By Edward Smith, M.D., LL.B., F.R.S., Assistant-Physician to the Hospital for Consumption, Brompton.

The subject of the dietary in gaols has attracted so much attention, that three public (or *quasi*-public) bodies have, within the last fifteen months, been appointed by the State to report upon it and other subjects involved in gaol discipline, viz., a Royal Commission, having at its head Earl Grey; a Committee of the House of Lords, with the Earl of Carnarvon as chairman; and a Committee of Medical Officers to Convict Prisons, appointed by Sir George Grey, with Dr. Guy as chairman.

As I propose to limit my remarks to the department with which I am most familiar, viz., to county and borough prisons, I shall only state in reference to the Royal Commission that it received conflicting evidence as to excess in the dietary of convicts employed on public works, and reported* that, "under these circumstances we are not prepared to recommend positively that the rations of these prisons should be diminished, but we think it desirable that experiments should be tried in order to ascertain whether any reduction can safely be made." The solid food in the diet at Portland contained weekly 171 ounces of bread, 39 ounces of cooked meat (equal to upwards of 50 ounces of raw meat), 112 ounces of potatoes, and 30 ounces of suet pudding, which, exclusive of liquid food, yielded about 40,000 grains of carbon and 1,700 grains of nitrogen.

The Former Dietary.

Before showing what has resulted from the labours of the other inquiring bodies, I will explain in a few words the state of the dietary question in county and borough gaols at the time when the committees entered upon their duties.

Under the existing law there is no one authority which is supreme on dietary questions, but the magistrates in Quarter Sessions of each county frame such a scheme of dietary as they think proper for their own gaols, and send it for approval to the Home Secretary, who may disapprove of it, but who has scarcely ever withheld his concurrence. The Government prepared a scheme of dietary in 1843, which it recommended to the magistrates, but it has never enforced, and has never had the power to enforce, its adoption. Hence in practice the magistrates, and particularly the Visiting Justices of Gaols are the great authorities on the dietary of prisoners, but as they can only act each for his own gaol the authorities are numerous, and, as I shall now show, widely discordant. A return of "Dietaries for Convicts, &c.," issued by the Government in 1857, and the report of the Committee appointed by George Grey, show that one-half of the gaols throughout the country are non-conforming in reference to the Government scheme of dietary, and these differ from the others in the particulars of numbers of scales of dietary, the relation of labour and duration of imprisonment to these scales, and the kind and quantity of food in each scale. This diversity of system is so great that it has long been notorious, and is referred to by the witnesses who gave evidence before the Lords' Committee, and in the reports of the Lords' and of Sir G. Grey's Committee, and was pointed out in detail by me in a paper read before a special meeting of the Social Science Association in 1859, and printed in the *Philanthropist* of that year. It is not necessary that I should here analyse these non-conforming dietaries, and I will, therefore, only point out the scheme adopted by the Government.

The basis of the scheme is, that the food supplied shall vary with duration of imprisonment and with labour, in such a manner that it shall be greater as the sentence is prolonged to four months, and that a prisoner sentenced to hard labour for a shorter sentence shall have the diet of one sentenced for a longer period without hard labour. Thus both hard labour and duration of imprisonment were believed to demand increased food, and were in that respect interchangeable. The theory in reference to duration of imprisonment was, that a man in confinement required more food than in freedom, and the demand increased in proportion as the duration of confinement increased, and it was based upon the fact, that the prisoners fell off in health and strength after submission to the influence of the lower dietaries, whilst they remained in *statu quo*, or thereabouts, when fed upon the higher dietaries. I only stay here to add the remark that this supposed influence of confinement was not proved in any way, as by placing the prisoners under short sentences upon the fair dietaries of free labourers, but the prisoners were empirically placed upon low dietaries, which Sir George Grey's Committee state "introduce a strong penal element into classes one and two, for we have no knowledge of any class of persons who voluntarily limit themselves to bread and gruel for a week, much less for three weeks at a time;" and hence as they had supplied less food than a man wants in freedom, it is more reasonable to say that the higher dietaries were necessary, because the low dietaries were insufficient to maintain health and strength. The evil of the low dietaries was limited by the short duration of their use, and the low diet was supposed, but not proved, to be such that the body could bear it without long-continued or permanent loss of health and strength. It was further limited by being restricted to the short sentences only, for the prisoners condemned to long imprisonment began to be fed at once upon the better dietary, but this limitation was removed in a few gaols by the Visiting Justices, and a new penal element was introduced, which is now designated "progressive dietaries," under which every prisoner begins upon the lowest scale of diet, and obtains better food as the duration of imprisonment increases. Here also it must be noted that it had not been proved that the dietary of the lower scales was sufficient to maintain health and strength, and if by comparison with the dietary of free labourers they may be affirmed to be insufficient, those prisoners who enter the gaol in fair health and strength are first lowered in both, and then, so far as the scheme permits, are restored to their former state.

Thus a scheme was formed on certain suppositions, but without any proof on the following fundamental questions, viz.:—

1.—The effect of confinement absolutely over the necessity for and due digestion and assimilation of food.
2.—The effect of confinement in its progressive duration, assuming the sufficiency of the food in the dietaries for short duration.
3.—The sufficiency of the lower classes of diets as inferred from the food of free labourers, and as proved by the effects upon the body.
4.—The necessity for luxurious food in the highest classes, as estimated by the same standards.
5.—The effect of various kinds of labour included under the term "hard labour," with a view to exactly adapt the dietary to the requirements of each.
6.—The assumption that all kinds of labour demand the same supply of food.

Yet the scheme was laid down with as much apparent precision as if the bases had been proved, and a plan of five classes was devised which was to meet the Home Secretary's precise requirements, viz.: "that the food should be sufficient, and not more than sufficient, to maintain health and strength," and "that the dietary should on no account be made an instrument of punishment." But this

* Report of the Commissioners appointed to inquire into the operation of the Acts (16 and 17 Vict., c. 99, and 20 and 21 Vict., c. 3) relating to Transportation and Penal Servitude, 1863.

occurred twenty years ago, when the knowledge of the nature and effect of foods was very small, and when methods of research were scarcely discovered, and were restricted in their use to very few persons.

Such, then, was the state of the questions at the period when the committees undertook to make inquiries respecting them. A scheme was provided to meet different conditions, not one of which had been duly estimated with scientific precision, and from which, therefore, there were as many dissentients as consentients, and an actual assemblage of dietaries differing in the quantity, quality, and kind of food supplied, and in the conditions in which they were to be enforced.

I now proceed to describe the operations and the conclusions of the two Committees who undertook to investigate the matter.

The Lords' Committee.*

Lord Carnarvon's Committee, when examining the various witnesses on the discipline in gaols, ascertained the views of gaol officials, and particularly of Sir Joshua Jebb, in reference to dietary, some of whom, as Mr. Merry, Chairman of the Visiting Justices at Reading, urged that the higher classes of dietaries were better than the dietaries of the labouring classes in freedom, and better than workhouse dietaries, and therefore wished them to be reduced: they also admitted and approved the penal character of the first-class dietaries, and also approved of progressive dietaries. Others, as Sir Joshua Jebb, expressed the opinion that prisoners need much food in prison; and others still, as Mr. Perry, Inspector of Prisons, thought that the present system worked well, and that progressive dietaries would be injurious to the prisoners.

Two scientific witnesses, having no official connection with county prisons, viz., Dr. Guy and myself, were also examined, and as my examination took place first, the questions and answers were, on numerous occasions, read over to Dr. Guy, and his opinions solicited. The Committee were especially desirous to ascertain if dietaries could be framed from which the meat element could be excluded, and they asked me if I could frame new dietaries for county gaols. I affirmed that the two lowest diets in the government scheme were too low to maintain the health and strength of the prisoners—that the lowest would be a starvation dietary to one long fed upon it, and that, on the other hand, it was highly probable that more meat was allowed in the fifth class than was necessary. I regarded the third and fourth classes as those upon which the health and strength could probably be maintained. I declined to frame new dietaries, on the ground that much new information was needed before any dietary could be fixed upon a final basis, and without this the scheme would be made up of guesses which would not carry conviction of its worth to the minds of others, and would thus leave the question as unsettled as before. These questions were—the influence of confinement over the digestion and assimilation of food, and over other functions of the body; the necessity for the expensive and luxurious foods, meat and fat, or the probability of supplanting them wholly or partially by milk and starchy foods, and the precise influence of the tread-wheel and other and most diverse kinds of labour which constitute prison discipline. These having been satisfactorily answered, there would not be any difficulty in framing dietaries so as to settle that question. Dr. Guy, on hearing that answer read, concurred generally, but thought that it was not necessary (although desirable) to determine the points with so much precision, and was of opinion that it could be got at roughly. He wished to supply a uniform quantity of bread and a certain quantity of potato daily, and was of opinion that the meat element might be omitted from the dietary, and in proof furnished the Committee with a series of dietaries so constructed, but which, as he subsequently said, would require to be tested by experience. Hence both concurred in the necessity for new experimental researches, either roughly or minutely made, in order to frame new dietaries; and in reference to the mode by which it should be effected, Dr. Guy was of opinion that a prison official, with one or two coadjutors, would be the best mode, since a committee "is never of more value than the best man in it."

When the Committee sought to agree upon their report, there was some difference of opinion in framing the clauses on dietary, but at length they agreed that the dietary in county and borough prisons was very unsatisfactory from total absence of uniformity, and from the irreconcilable inequalities in the nature and the amount of food given; and that the dietary framed by the Secretary of State was not sufficiently based upon scientific and medical principles to be taken as a satisfactory guide. Classes 1, 2, and 3, were thought defective as regards quality of the diet, and classes 4 and 5 contain food beyond the reasonable requirements of health; and on the evidence a diet of vegetable and farinaceous food, with the assistance of milk and some slight addition of meat, might be used by the prisoners without risk to health. Such were their views, but, decided as they are, they were unwilling to act upon them, but add "that they are not prepared on their own responsibility to recommend any one table of diet to be made uniform for all prisoners, but draw special attentfon to the medical evidence which Dr. Smith and Dr. Guy have given, and to the four principal scales of diet subjoined." They then go on to say, "but it appears that there are still medical and scientific questions as to the effect produced by confinement upon prisoners, and as to the necessity for certain ingredients in the food, which require further investigation. Under these circumstances the Committee recommend that a commission be issued to inquire into these questions, with authority to determine by experiment the points referred to them."

Such, then, is the position in which the question was left by this Committee of the House of Lords. They found the present system unsatisfactory, the government scheme a bad guide, certain classes of diet too low, and others two high, certain questions to be settled before the subject would be ripe for final decision, the propriety of taking such steps as would finally settle the question, and this on the full understanding that such inquiries would delay the decision for one or two years. Hence they add their opinion to that of the Royal Commission that experiments should be made, and that in the absence of them they were unprepared to take any action.

Sir George Grey's Committee.*

The report of the Lords' Committee was made in 1863, and in the following months many persons were interested to ascertain the course which the Home Secretary would pursue. As the number of chemists and physiologists who could or would undertake such an inquiry was small, it was soon ascertained that no Commission had been issued, and that no scientific inquiries were in progress. Silence and mystery seemed to hang over the subject, and it was only in an indirect manner—that is, in answer to an inquiry by a Visiting Justice, that it became known that a Committee had been appointed; after which the issue of a circular to Visiting Justices made the fact widely known; but the names of this Committee, with the exception of that of Dr. Guy, were not revealed, even

* Report from the Select Committee of the House of Lords, on the present state of Discipline in Gaols and Houses of Correction, 1863, H.L., 37.

* "Prison Discipline, &c." "Copies of Correspondence between the Secretary of State for the Home Department and the Inspectors of Prisons, relating to the Report of a Select Committee of the House of Lords on Prison Discipline; and of the Report of a Committee appointed by the Secretary of State to inquire into the dietaries of County and Borough Prisons."—H. C., 20 May, 1864.—313.

in the answers to the questions asked in the House of Commons. The sole interest in this part of the question was the inference to be drawn as to the plan which would be pursued in carrying out the wishes of the Lords' Committee, for the known opinions of the gentlemen appointed, as well as the special departments of knowledge with which they were and were not familiar, must necessarily influence their method of handling the subject.

When the appointment of the Committee became known, as also the fact was ascertained that no chemist physiologist of high-standing was engaged by the Committee to assist in the inquiry, it was inferred that the course recommended by the Lords' Committee would not be pursued, and that the subject would be left to the guide of so-called experience and statistical analysis.

I now turn to the report of this Committee, and purpose to show what the Committee state they have not done, and then what they have done.

From this report we find that the Home Secretary referred to the recommendation of the Lords' Committee to the Inspectors of Prisons—Messrs. Perry and Voules—and they reported in a sense directly opposed to the view of the Lords' Committee, and were of opinion "that the required modifications might be better ascertained by practical observation and experience than by a Commission with authority to determine these points upon scientific evidence alone." (I remark, *en passant*, that the word "alone" raises a false issue, for the Committee did not state that all questions of dietary were to be settled by experimental inquiry.) Here arose a conflict between two methods of inquiry—one trusting to the fallacious mode of common observation practised by a number of persons varying in powers of observation and in special training; the other seeking to apply the exact methods of scientific research by men who, amongst their compeers had proved themselves capable of making such researches not unsuccessfully. That those who were not familiar with such scientific researches should prefer the readier, and, to them, the only available method of common observation or so-called experience, must necessarily follow.

With two authorities, both agreeing in the necessity for some change in the present system of diet, but differing *toto cœlo* as to the mode whereby the change should be effected—one content with imperfect knowledge and inexact results, the other demanding such additional knowledge as would place the results upon a sound and final basis—a middle course was adopted, and a committee of medical gentlemen, not known in chemico-physical research and in county practice, was appointed, who, at the same time, were informed that they had to conduct experimental researches. In reply to a question, Sir G. Grey writes—"It is one of those medical and scientific questions which, in the words of the report of the Lords' Committe, require further investigation, and which can only be properly determined by experiment. One object of the inquiry which you and the medical gentlemen associated with you have been requested to undertake is the solution of this question."

Having appointed this Committee, the Home Secretary instructed them that the prison dietaries which they were to recommend must be sufficient and not more than sufficient to maintain the health and strength of the prisoners; that they must not be in more favourable contrast to the ordinary food of free labourers or the inmates of a workhouse than sanitary conditions render necessary; that they must bear in mind the different habits of life and quality of food of free labourers in different parts of the country, and that they must prove by experiment as to whether the health of prisoners under long sentences will bear their passing through the lower dietary of the shorter sentences—a progressive dietary—or whether they must be at once placed upon the higher dietary of their own class.

The Committee in their report recapitulate the duties assigned to them, and state that they are required to recommend dietaries for different durations of imprisonment; to say whether the dietary for the longer sentences shall be progressive or not; to avoid any approach to luxury, and to take care that they shall not be excessive, and to arrange that they shall be sufficient, and not more than sufficient, to maintain the health and strength of the prisoners.

Such are the duties assigned to and accepted by this Committee, and they imply exact knowledge upon the following subjects, viz.:—The effect of confinement absolutely and in its duration; the influence of labour in the various degrees of prison punishments; the amount and kind of food which is exactly adapted to maintain health and strength under the different conditions of sex, age, locality, and habits of life, of duration of imprisonment and diverse kinds of labour, and the necessity for the so-called luxurious foods. Let us now inquire to what extent the inquiries instituted by this Committee have set these questions at rest.

What the Committee have Left Undone.

The effect of confinement is generally stated to be such that more food is required in prison than in freedom, and with long sentences than with short ones, although in the absence of the usual amount of exertion the contrary might seem more probable. Sir Joshua Jebb, in his evidence before the Lords' Committee, stated such to be his opinion, and in my evidence I explained it by showing that the power of assimilating food is lessened in confinement, so that a larger proportion of food passes off unused by the bowels, but the degree in which this occurs is unknown, and to determine it special scientific inquiries, such as I had made for the British Association, were necessary. Upon this, apparently, the Lords cited these as fit subjects for scientific investigation. Sir George Grey's Committee, however, in their report, when quoting this recommendation of the Lords' Committee and the statement of Sir George Grey, that they are requested to undertake the solution of that question, remark that the problem is "not capable of solution by scientific inquiry, but only by experience." They write:—"As we should be sorry to disappoint any apparently reasonable expectations which may have been formed of the result of our labours, we desire at once to express an opinion that there is no experiment, or series of experiments, which we could devise, or which we could hope to obtain facilities for making, which would show the true effect produced by confinement upon prisoners." As to the facilities necessary for such inquiries, the Committee were acting under the competent authority of the Home Secretary, and might surely have obtained them; and if they were unaware of the mode by which such experiments were conducted, as they say they were, the fact that others had devised successful methods, as well as the conclusion at which the Lords' Committee had arrived, and the express duty of experimental inquiry delegated to them by the Home Secretary, would lead to the inference that they should have ascertained from others more familiar with such investigations the proper course to pursue. But after having thus expressly stated that "there are no experiments, or series of experiments," whereby this question could be determined, in the next paragraph they go on to state a mode by which, in their opinion, it could be ascertained, viz., by comparing two groups of properly chosen men in confinement and in freedom; and they add the remark that "such an experiment must be one of considerable duration." Such a mode of inquiry was open to them, and no doubt much time would have been occupied in it; but it was so stated in the evidence before the Lords' Committee, and on that understanding that Committee advised the appointment of a Commision. If, therefore, notwithstanding their statement that no experiments could be devised, they did devise them, it was surely their duty to have made them. But to make the climax still less satisfactory, after stating that they could not devise the experiments, and yet did devise them, in

the next paragraph they excuse themselves from prosecuting them by a second contradiction as follows:—" As the opportunities for making such an experiment do not exist, and cannot be created, it is obviously not in this direction that we must look for instruction." Such seems to be obvious so far as relates to their own acts, but it does not follow from their own arguments, neither does it prove that others could not have found " instruction " from such inquiries. They thus at once avoid a duty delegated to them by Sir George Grey, affirmed to be necessary by the Lords' Committee, and proved to be practicable by a witness who had performed it; and what do they give us in place of it? They say " we must be content, therefore, to adopt and act upon certain prevailing opinions respecting the influence of health and the counteracting effects of certain kinds of food and certain dietaries,"—that is, must accept as true that which they were specially appointed to investigate, and which had not hitherto been based upon scientific proof, but upon opinions only. Surely no Committee was required in order that this course might be pursued.

The subject is a fundamental one, for the whole fabric of the scheme of dietary must be based upon it, and yet the Committee have left it precisely as they found it, and based their recommendations upon an " improved series of facts."

But did they not adopt some other method of proof besides that of " certain prevailing opinions? " They quote a statement made by the Inspectors of Prisons, to the effect, that animal foood should not be withheld from prisoners of the agricultural class, even in those counties where meat forms a very rare ingredient in their ordinary diet, because the confinement of a person lessens his powers of digestion and assimilation of vegetable food; and then add, " though not admitting of being put to the test of experiment, we adopt and are prepared to act upon it, out of respect to the authority from which it emanates." Thus our highest scientific authorities become the Inspectors of Prisons, and they make a statement of a purely scientific character, which could only be proved by scientific inquiries, and not by common observation or experience, and yet the Committee affirm that no such proof can be obtained; but because the Inspectors state a fact, they are " prepared to act upon it out of respect to the authority." Could anything be more illogical—to deny the proof, and yet accept the authority, to be appointed to prove facts by experimental researches, and to be content to record and act upon an individual opinion? Hence upon this important and fundamental question the State is called upon to act upon grounds not capable of proof, but upon " prevailing opinions," and upon approved statements of Inspectors of Prisons.

So much in reference to the question of the effect of confinement absolutely—what of the further influence of duration of confinement, with a view to determine whether the quantity and quality of food must be increased in order to maintain health, as the duration of the confinement increases? If the effect of confinement cannot be proved, how can proof be obtained of the effect of duration of confinement? Upon this rests the proof of the necessity for different scales of diet with different durations of imprisonment, for the condition imposed by Sir J. Graham must be borne in mind, that for any, the shortest duration, " the quantity of food was to be sufficient, though not more than sufficient, to maintain health and strength."

If a dietary for three days' imprisonment effect this object, it will be equally fitted for three months' imprisonment, unless it be shown that duration of imprisonment exerts such an influence that more food is required to maintain health and strength as the duration increases. If the latter be true we shall require different scales of dietary, increasing in nutriment up to the point when this effect of duration of imprisonment has obtained its maximum. Hence, before any step can be taken towards the construction of dietaries we must know how much more food is required by duration of imprisonment—its rate of increase with duration, and where the extreme limit occurs.

It will be readily understood that as the Committee could not devise any experiments to prove the effect of confinement absolutely, they could not do so to prove the effect of duration of confinement, and yet any scientific man who could ascertain the former, could prove the latter also; and they cut the knot by simply following the example of the framers of the existing scheme of government dietaries for county gaols. They criticise severely the grounds upon which the framers of that scheme proceeded, and yet they accept this part of their results without new inquiry, and whilst knowing that there are gaols in which the dietary is the same for all prisoners, and that fully one-half of all the gaols in the kingdom adopt schemes in which the duration of imprisonment differs from that of the government scheme. They say, " But as the dietaries thus recommended by Sir J. Graham may be presumed to have represented his real opinions, at least, as faithfully as the comments which accompanied them, we shall to a certain extent take them as our guide. We shall assume that criminals sentenced to short periods of imprisonment are not only to have less food than those sentenced to longer periods, but that the food ought to consist of fewer elements, and those not of the most attractive character."

Hence, again, this Committee have entirely begged the question, and have assumed that which they undertook to investigate.

The question as to the propriety of placing each prisoner upon the diet of the lowest class, and advancing him to better food as the duration of his imprisonment progresses through the different classes, must entirely rest upon two facts; first, the sufficiency of the lowest dietary to maintain health and strength, and the necessity for a better dietary with duration of imprisonment. If the former be not proved, you may place each man upon an insufficient dietary for a time and lower his health to a state from which he may or may not be raised by the better dietaries when he reaches them. If the latter be not proved, then the whole progression may be unnecessary and one class of dietary may suffice. The latter was neither proved nor investigated by the Committee, and for the former—how was so important a matter settled? Of course by experimental proof, or if not, to take the plan pursued by this Committee, by sufficient experience and authority. They neither adduce experiment nor authority, but say, " As it is obvious that it is quite possible to frame two distinct dietaries—the one on the supposition that the prisoner is placed at once on the diet of his class, the other, &c.," and " that it is quite practicable to do this with due regard to the maintenance of the prisoner's health, this Committee feel that the grave responsibility rests upon them of deciding a question, which, ceasing to be one of health, becomes one of discipline." They affirm that it is obvious that the lowest class dietary is sufficient for the maintenance of health and strength. How is it obvious? It is not a self-evident proposition, and they adduce no proof, neither that of experiment nor authority, and yet they say " it is obvious."

They make simply an affirmation, and again beg the question, and upon such reasoning take upon themselves to do that which the law only should do, viz., to decide upon a matter not of health, but of discipline. They say, " We accept the responsibility, and at once embrace the alternative which commends itself to our judgment as most consistent with common sense and common justice, viz.: that all prisoners, without exception, shall graduate through the dietaries proper to all the sentences shorter than their own until they reach the dietary proper to their own class." Thus they assume the position of legislators and make an important law on their own affirmation, without experiment, without even quoting authority, and in defiance of the direction of the

Home Secretary who appointed them, and who informed them that "it is one of those medical and scientific questions which, in the words of the report of the Lords' Committee, require further investigation, and which can only be properly determined by experiment. One object of the inquiry which you and the medical gentlemen associated with you have been requested to undertake is the solution of this question."

They do not quote any authority; yet it may be added that the Lords' Committee, acting in their capacity of legislators, recommended this course. The Inspectors of Prisons—the gentlemen to whose authority upon scientific matters they implicitly bow—objected to this course, as indeed did the late head of the department to which all the Committee belong—Sir Joshua Jebb—in their answers to the Lords' Committee; but with such a weight of authority against them, they say "we accept the responsibility," and decree otherwise.

Hence upon the questions of the influence of confinement absolutely, and as affected by duration, their instructions are set aside, no experimental researches have been undertaken, no scientific knowledge applied; but action is taken upon their own unsupported affirmations —upon authority which they accept in one matter and reject in another equally without examination—upon "prevailing opinions," and upon the plans of those who had preceded them.

Let us inquire as to the mode of determining the question of sufficiency, and not more than sufficiency, of the food supplied under the various influences of sex, age, habits of life, locality, and labour.

As to food. It was stated in evidence before the Lords' Committee that experiments were required to prove what amount of food was necessary in confinement, and whether certain kinds of food, which are expensive and luxurious, are necessary to the system, and upon this evidence the Lords advised that a Commission should be issued to make experiments. Upon this Sir George Grey's Committee remark that the medical and scientific questions concerning which the Lords recommended that further investigation should be made, are not distinctly stated. They think that the proper ingredients in dietaries, and the proportion in which they should be blended, are well known, and the only undecided question is the quantity of these ingredients which men require under different circumstances. Hence they find one subject, and that not an unimportant one, on which they had need of further inquiry, but they add immediately, "It is not known, nor can we ascertain by any series of observations which we can hope to be placed in a position to make, whether a prisoner subject to the depressing effect of solitary confinement requires more or less food than the same prisoner working in association in the open air." But that knowledge lies at the very root of the question of sufficiency or insufficiency, and must be obtained before a dietary can be framed which shall exactly keep the prisoner in health and strength; and yet, they make no experimental inquires, nor obtain new information of any kind. They again refer to "prevailing opinions," which they say indicate that a liberal diet should be given in confinement.

What, then, do they look to as their guide? If the proper quantity of food to be given to persons in confinement is unknown, and they do not take any steps to add to existing knowledge, how do they satisfy themselves in discharging the important duty assigned to them of exactly adopting the food to the requirements of the prisoners? They ask the opinion of the Visiting Justices of prisons, and accept that as their only guide.

As to age. They do not make any inquiries or any statement beyond that of recommending the dietary of women for boys under 14. In reference to sex they affirm that a woman weighs one-sixth less than a man and should have one-fourth less food than a man, but they do not make any new inquiries nor give any proof upon which to base such a statement, and in their tables a greater difference is made, viz.: a reduction of one-third in the quantity of meat allowed to women.

The habits of life and the kind of food of the prisoners when in freedom were thought of sufficient importance by the Secretary of State to induce him to give the Committee special directions to consider them, both in reference to the quantity and quality of the food in prison dietary; but what say the Committee on this subject? They write, "It is extremely difficult to ascertain what the ordinary food of free labourers is," and "even if the inquiry were limited to the worst fed, viz., agricultural labourers, the true facts would not be readily obtained, and it would still be more difficult to obtain such an acquaintance with the different habits of life and quality of food of free labourers, in different parts of the country, as would admit of practical application to the dietary in hand." Moreover the first would not be a guide if the food were badly chosen, badly cooked, and not sufficient in quantity, as they believe to be common in large families and poor neighbourhoods. The standard requirement is not that which any class of labourers obtain, but that of the actual necessities of the prisoner.

Hence they do not investigate this subject, or, as Sir George Grey wrote, "bear in mind the varying circumstances, &c., because it is difficult; and yet at the very time to which this refers, the inquiry had been made by the Privy Council in every county in England, and the required information could have been readily obtained. But although this was too difficult for them to undertake, they excuse themselves by laying down an important and trustworthy principle for their guidance—that of the necessities of the prisoners. Did they inquire into this fact, and thus settle the question? Not at all. No experimental inquiries as to the food which was required by a prisoner in any locality, much less in various localities, were made, and the matter was left precisely as they found it.

But the most remarkable occurrence was the course which they pursued in reference to labour. They leave it to the authorities, as at present, to affix their own meaning to the term "hard labour," (which hitherto has varied from receiving the instructions of the chaplain to continuous labour on the treadmill, or at the crank), and make certain additions to the dietary without labour. They do not make any experimental inquiries as to the effect of the various kinds of hard labour upon the body, with a view to estimate accurately the food which is required to meet the waste thus caused, and thus to afford a guide to the magistracy in the selection of labour, but take as their minimum a labour which visibly increases the breathing and opens the pores. How, then, is it possible for them to apportion food to a condition of the body which had not been ascertained? They simply avoid this part of their duty also, and arbitrarily make certain additions to the dietary on the ground of this hard labour. But if the food which they advise should be insufficient, how is their recommendation to be rendered in accordance with the directions which they received? This they meet in a most amusing manner, by placing their own responsibility on others—by recommending that the labour be reduced till the prisoner on the dietary prescribed by them is able to bear it. They were directed to ascertain what food is required to sustain the health of the prisoner with labour, and they fulfil their task by guessing at a scheme of dietary, and, that failing, recommend *that the labour be brought down to the dietary!*

As this will scarcely be credited without proof adduced, I cite their own words:—"We think it more reasonable, as well as more economical, to apportion the punishment to the diet, than to raise the diet to the level of the punishment. If, therefore, the labour on the crank or treadmill, whether through the amount of exertion or its duration, should in any case prove excessive, so that the prisoners are evidently suffering in health, we recommend that the labour be gradually reduced in duration and severity till the prisoner, with the usual diet, is able to

bear it." If the mountain will not come to Mahomet, Mahomet must go to the mountain.

(*To be continued.*)

ART RESULT SOCIETY.—PROPOSED MODE OF ACTION.

By C. Bruce Allen, Architect.

It is at all times very difficult to impress on the thoughts and minds of others the like sense of the importance of any particular plan of action new to others, but long held in the mind of the original proposer. Sometimes, indeed, it is found to be a matter of no small difficulty and labour to induce even those interested to be at the slight pains of endeavouring to fully comprehend the meaning and full scope of the new proposition, so as to enable them to come to a fair judgment on the merits and demerits of it. Happily, in the proposal now submitted to the consideration of the Society of Arts, the whole work may fairly be said to be already more than half accomplished, and it remains only to try and point out how best and most effectively the rest may be worked out, so as to save all that painful expenditure of means and strength which must always follow from the partial comprehension and working out of an idea.

Those who have watched the progress of the fine arts of the time since the period of the Exhibition of 1851 must have noticed the very many efforts that have been made to add to the value, as works of art, of objects in daily use, furniture fabrics, and articles of art manufacture generally, and have, perhaps, wondered not a little at the fact, considering the efforts made, at not being able to find the evidences of so much painstaking in the common things about them, or indeed any signs whatever of a *change* in them. But the wonder will surely cease when it is remembered that all these efforts hitherto have been confined to the contriving different modes of *drawing on paper* and on a flat surface, and to novelty in designing, and that until the Society took up the cause of the workman, and asked for specimens of his skill and handiwork in the material of his trade, there was and could be nothing visible to the public to evidence a change. The recognition, during the last year, of the workman and his work, fairly started this, in modern times, entirely new movement in fine art, and was in reality the commencement—but still only the commencement—of an entirely new era in modern fine art efforts. It is difficult at present, and in its present crude state, to see the full drift, and in the future the lasting importance and strength of this movement; but none will doubt its future power who bear in mind the fact that all we ever see of art in common things and buildings comes direct from the hands of our common workmen. The artist may have shown him *how* to do the work, but the real and actual work is his.

Another fact, bearing directly on this, is that of the many and successive changes which have, from time to time, and within the same interval, been made in the various Art Schools, both public and private, in the method of teaching elementary drawing, and how best to bring the art of drawing to bear on practical work, nearly every conceivable plan would seem to have been tried but the right one, and there is but one; high art has been urged, and low art, and line drawings, and shadowed drawings, and perspective, and water-colour drawing, and even oil colour itself attempted, but all, nevertheless, have unfortunately and utterly failed to do that which they were supposed able to do, and by so many fondly hoped to accomplish, namely, to help the workman to produce, and afford to the public, through him, fine art work. If anything were needed to make plain and evident this fact, it would be found in the government report just issued on the Schools of Art and their mode of art action. None will say there has been lack of effort and trial plans, for the system has varied year by year, and, indeed, it would seem, at first sight, not a little surprising and disappointing that more perceptible improvement in some one or other direction, or at least change, did not manifest itself. But there has been none. The Art Schools of the present hour are as void of practical and *material*, and even of artistic result, as were the Schools of Design when they were a year old, now more than a quarter of a century ago. The reason is plain enough, and it is this: that, according to a law of art and of nature, but a very *few* are, in each generation, gifted by nature with the art faculty in sufficient strength to make their work, as copyists on flat surfaces and as makers of representations of existing things, of any art-value at all; so that the attempt to manufacture artists, and to urge ordinary men to display this high and rare faculty has, as in the nature of things it must, ended in total failure. In every age, doubtless, a certain given number of minds are produced, capable, with cultivation, study, and practice, of accomplishing that great and rare art of painting pictures, drawing, and engraving; but such minds are very limited in number, and cannot be added to from the common bulk of humanity by any process, possible or conceivable, of art education. But to do this impossibility has been the object, unwittingly, of the Schools of Design and the present Art Schools, by the apparently easy and obvious process of taking and forcing the student, whether workman or draughtsman, through a series of art "grades," as they are termed, beginning with lines, and ascending through these grades successively to—when it was even in appearance possible—picture painting, or drawing. This has all failed. Neither picture-painters nor pictures can be thus produced, and the whole work, after all these years of trial, has to be begun again from a new starting point; and with, it is to be hoped, a total forgetfulness and abandonment of all that has hitherto been done or tried. It is here that it is thought this plan of a Result Society in Art would help to indicate the true way; and its consideration will, it is hoped, assist in interesting the Society of Arts in its formation, for such a Society would always point to, and ask for, the great end of all art power, viz., the impress of it on material and in objects of common and every-day use, and it would then consequently be the object of all Art Schools, whether public schools or private schools, to give to their students the art means, and those *only* required by them in their daily work. This would not be picture painting or drawings on paper, but the power to draw on the material of each workman's own art trade, so as to enable him to add to his ordinary and necessary work some one or other artistic addition; in short, to make his work fine art work, as we see in the works of the past, and not merely ordinary labour and manufacture, or handicraft.

It must here, however, be noted and kept in mind that it would seem to be very doubtful how far the usual run of our ordinary workmen will be able of themselves to master the two-fold difficulty of drawing and art-workmanship. It is altogether beyond present practice, for our *workmen* cannot, as a class, *draw* at all. To teach the workman this necessary and primary art has yet to be begun, *i.e.*, the drawing useful to him in his trade—a working drawing—not this even for its own sake—but simply for the purpose of enabling him to *copy* such drawing on material, previous to and as a guide to its execution. It would seem the better plan to confine the workman to his material and his work, and leave the drawing to the regular draughtsman; and here again it is thought that this proposed Society would act with peculiar and effective energy, for it would never ask for drawing for its own sake, but it would demand such drawing only as a means of interpreting the art work it had before it. Pictures and pretty drawings and sketches would be out of place and uncalled-for, the whole and sole interest being in the design and its interpretation through the drawing—the one actually wrought from—to the art object itself.

These principles, thus hastily sketched, are well exemplified in the drawing accompanying No. 609 of the Society's *Journal*, viz., the inkstand, or watchholder, to be carved in wood, by Holbein, selected as the subject of a prize to the art workman. We may suppose this to be a geometrical sketch of the object in a shop or art factory, by the draughtsman or artist in such establishment; and a very difficult subject indeed for an ordinary art workman it is, for an accomplished artist, of power and long experience, could not do more than justice to the three figures which help to support it,—indeed the arabesque ornament alone will try the skill of the best of our executive workmen. The proposed Art Result Society, while demanding the inkstand itself, and recognising the actual workman and wood-carver, would and must feel equal interest in the geometrical drawing or rather drawings required by the workman to execute the object from. No workman in this case—to cite it fully as illustrative—could well do with less than two elevations, a plan, and a plan of the top, and perhaps a section, and it would be such full-sized working drawings that the artist-draughtsman would be called on to supply, and for which he would be recognised and rewarded side by side with the workman. Everything should be clearly shown which the workman has to form or carve, and nothing left for guess-work—his power consisting in the ability to realize the drawing in wood, and his art power in drawing the various parts on the wood—and finally in carving them.

It is true that the present action of the Society of Arts is, it is thought, defective, for why should we go back to the days of Holbein, or to Holbein himself, for this design, good as it is; why should not some modern and living draughtsmen in some of our shops or art factories have been asked to contribute a design for an inkstand? What a pity it seems that all opportunities to help the artists of the present day should not be taken advantage of, and encouragement, and help, and hope held out to them. It would seem absolutely certain that there are numbers of artist draughtsmen thoroughly able to design and supply working drawings of an inkstand fully equal to this, and more adaptable perhaps to modern uses. It would be the duty of a future Society, such as is here urged, to *reject* those productions of past times and dead artists, and to encourage present times and living artists, quite as able if only recognised and encouraged. The proposed Society would invite in one year our artists in the shops and art factories to contribute in competition designs and working drawings of any art object which might be thought most suitable, and within the capacity of our present race of workmen, and such drawings would then, in the following year, be offered to the workmen in competition, to be worked from by them, and the combined results, the drawing and object, exhibited together as tests of the then state of designing and executive ability of both draughtsmen and workmen. Parts of objects only need be demanded, as the lower part of a pilaster pannel, such as that from the Castel R. Pandino, given in the same number of the *Journal*, so that but one drawing would be needed; such drawing, however, being a full-sized working drawing, and not a mere sketch. The more complete the subject, of course the better, as it would be more readily appreciated by artists and the public. Simplicity of subject at first, and easiness of execution, should be the guiding rules, till it be shown by the resultant work how much and what is now possible. Each year would doubtless add strength and facility, and it would very soon become evident that the art power of the past is not extinct, but only dormant for want of proper and honest exercise, and that the artistic strength of Donatello, Holbein, Fiamingo, Van Leyden, and others, whom the Society have now honoured by putting their good works before our modern workmen, are yet to be succeeded by modern and living men, if we but give them the same change, and encourage them to go to their work in the same way.

WEST LONDON SCHOOL OF ART.

The second annual distribution of medals and other prizes to successful students took place on the 20th July. The chair was taken by A. J. B. Beresford Hope, Esq., the President, who distributed the prizes. Among the gentlemen on the platform were the Earl of Powis, one of the patrons, Mr. Peter Graham, the treasurer, Mr. George Godwin, F.R.S., Mr. Hubert, Mr. Digby Wyatt, Mr. Joseph Clarke, F.S.A., Mr. Macdonald Clarke, the master of the school, and Mr. Lomax, the honorary secretary. The Chairman said they had met together for the second time to distribute the prizes gained by the students of what was the Marylebone School of Art, but which had grown into the West London School of Art, an important change. He thought there would soon be a more material connection between the school and the Architectural Museum. Last year the school had ten medals and two honourable mentions, while this year they had twenty-one medals and eight honourable mentions. In the national competition last year they had two medallions, the highest distinction conferred by the Department of Science and Art, and no honourable mention, while this year they had three medallions and one honourable mention. Nearly all the works they saw upon the walls that night had been done in the first occupation of those rooms; indeed, between November and March, a period of about three months. This was much to the credit of those who had done the work.

The distribution of prizes then took place.

Forty-nine students (including one lady) having obtained the mark "excellent" in the time drawing or second grade examination, gained prizes, which were severally delivered to them, the chairman expressing the pleasure he felt in doing so.

The next upon the list were the names of thirty-three students who obtained the mark "good" in the time drawing examination.

The following students obtained medals for their studies:—

Messrs. J. R. Bendall, F. Braun, J. T. Foot, J. Garner M. M. Glover, C. S. Gordon, J. H. Grant, S. H. Ives, H. Montford, G. S. Murdock, J. Peters, W. Poole, F. Tebay, W. F. Wetten, and E. Wormleighton.

The entire number of medals taken by the above-named students was twenty-one. Seven students were honourably mentioned.

The following students obtained the national medallion:—

Messrs. G. H. Ives, H. Montford, and G. S. Murdock.

Honourable mention was awarded in the national competition to Mr. W. F. Wetten.

A money prize, offered by Captain Jolliffe, M.P., for a sketch for a stained glass window, was awarded to Mr. T. Porter.

The following were entitled to prize studentship, having passed in four subjects and taken medals:—Mr. H. Montford and Mr. C. S. Gordon.

The following obtained prizes in the Society of Arts competition among art workmen:—H. Braun and F. Braun, who, the chairman said, were brothers, and marqueterie cutters.

Six students of the school had, during the past year, been admitted students of the Royal Academy.

In presenting the national medallion to Mr. Montford, the chairman said that his work marked him out as a man of high promise.

Last year's results were considered remarkable for a school in its second year; but a comparison with this year's afforded the most gratifying evidence of the increasing attainments of the students. A little over twice last year's number of persons worked successfully this year nearly three times last year's number of examination papers, obtaining more than double the number of "good"

marks, and *more than four times the number of "excellent"* marks obtained last year.

Earl Powis, Mr. Digby Wyatt, Mr. Peter Graham, and Mr. George Godwin addressed the meeting.

The vote of thanks was then passed unanimously to the chairman.

Fine Arts.

Public Works in France.—The city of Paris has called upon certain selected artists to send in plans for the proposed decoration of the Church of the Holy Trinity, to which work the sum of 43,000 francs (£17,200) is to be devoted. The municipality of Nantes is about to erect a statue in honour of the late Minister of State, M. Billault, and a letter just published by a young sculptor, M. Aimé Millet, gives a curious instance of *Nantais* munificence. The authorities of the place have published the terms of competition for this work, which includes a statue of the late minister and four decorative figures for the pedestal, and offers the fortunate artist who may gain this grand prize the sum of 14,000 francs (£560) for the whole, including the superintendence of the casting in iron and the cleaning and repairing of the casts. It is politely suggested that the Maire of Nantes has omitted a final zero.

Industrial Art in France.—The Union Centrale des Beaux Art appliqués à l'Industrie, of Paris, which has already been mentioned in the *Journal of the Society of Arts*, has received the authorisation of the government, and its museum and library of works appertaining to the ornamental arts are to be formally opened on the 20th of September. The society's house is No. 13 in the fine old square called Place Royale, near the Place de la Bastile. At the same time the Society will commence courses of public lectures and conferences on all subjects relating to industrial art. Another society has just announced an exhibition, to be held in the Palais de l'Industrie, Champs Elysées, in September and October, also for the encouragement of ornamental manufacture.

Ceramic Exhibition at Rouen.—An exhibition of French, and especially Rouenese *faience*, was opened in the above town on the 15th instant. The authorities and lovers of art of Rouen are working steadily and perseveringly to establish a grand collection of the ceramic wares for which the town and neighbourhood were once so famous, and which now fetch such enormous prices. An exhibition of the kind referred to was held there in 1861, and the profit, about 10,000 francs, was applied towards the purchase of a very curious collection of old ware, made by M. André Potter, the librarian and conservator of the Museum of Antiquities of that town. This gentleman delivered an interesting address, on the occasion of the inauguration of the present exhibition, on the pottery in question, which has been printed at length in the *Journal de Rouen*.

Amsterdam Exhibition.—This exhibition opened, according to promise, on the 17th instant, and the attendance was large, and included many distinguished personages; Prince Frederick, the uncle of the King of Holland, is the president of the commission, and presided at the inauguration. The building is constructed on the plan of the Crystal Palace. We talk of new styles of architecture, and lament the incapacity of the present age for inventing anything to take rank with classic and Gothic, but Rome was not built in a day. Crystal Palace architecture is making its way; it falls very short at present of a complete and systematic style, but it has features which demand recognition and admiration; it is eminently original; it meets one of the acknowledged tenets of architecture—fitness for its purpose; it is not like the renaissance, a variation of a preceding style; it is following the course of Grecian art; it is as independent and as promising as were the first rude buildings from which grew Doric, Ionic, and Corinthian; and if the sense of beauty and the capacity for a material rendering of that sense are not wanting in the people of the present age, the system which has furnished half the cities of Europe and America with economical and useful buildings may be the parent of a new style, for which the proper appellation will be that of the English, or that of the nineteenth century.

Bayonne Exhibition.—The accounts of this undertaking, as regards the fine art portion at least, are not brilliant. The place devoted to the exhibition of the pictures and other works of art is spoken of as a shed, ill-arranged and ill-lighted. Altogether the arrangements seem to have given anything but satisfaction, and, besides besides being unworthy of the undertaking, they are sadly in arrear. This is a pity, as a good exhibition of French and Spanish art and industry might have been of essential service to the two countries, and would certainly have been interesting to the whole of Europe.

Rouen Exhibition.—By an error the opening of this fine art exhibition has been spoken of as to take place in 1865; it really opens on the 1st of October next, and from the applications for space there is every reason to believe that the old capital of Normandy will have a large and brilliant collection of paintings and other works of art.

Female Art in France.—It is well known that a very large number of females find occupation in connection with the fine and industrial arts in France, and many have attained to high if not to the very first rank. Madame Lebrun is an instance in the last generation, and Rosa Bonheur a very notable one at the present moment. The prize lists of the Paris exhibitions always contain some names of lady artists, and the last exhibition afforded more than the average number of instances. Lastly, those who have visited the Louvre on a student's day cannot fail to have noticed the presence of very many female artists and students copying or studying from the works of the great masters. Lady artists in France, as elsewhere, naturally give the greater part of their attention to those branches of the art which require delicacy of touch rather than deep study and hard labour, such as miniature and fan painting, porcelain decoration, water colour and pastel drawings, but there are many remarkable exceptions, and more than one lady could be mentioned who holds in France at the present moment a high position, if not in historical, at least in *genre*, animal, flower, and portrait painting, and also in sculpture. But the employment of a female artist in the decoration of a church is an uncommon, if not a unique occurrence, and the employment by the Prefect of the Seine of Mademoiselle Nelly Jacquemart on a work in the Church of Suresne, near Paris, has caused a slight sensation in Parisian art circles. The young lady belongs to a family which has more than one artist besides herself amongst its members.

Commerce.

Cotton in China.—The accounts of the prospects of the cotton crops in the Celestial Empire are encouraging. The exports from the 2nd to the 27th of May are as follows:—From Shanghai for Liverpool, the *Unrivalled* with 6,960 bales, the *Helvellyan* with 8,680 bales, the *Elizabeth Nicholson* with 7,090 bales, the *Australia* with 4,990 bales, the *Fanny* with 3,750 bales, the *Cyclone* with 5,160 bales, the *D. Jex* with 1,870 bales; and for London, the *Neville* with 5,950 bales. From Hongkong there sailed for Liverpool, the *Glenlee* with 7,152 bales, and for London, the *Chandernagore* with 44 bales. The Dutch ship *Twee Councillescor* is reported to have sailed from Yokahama for London with 2,449 bales, making the export for the month 51,819 bales, and for the season (from June 1, 1863) 608,629 bales.

Imports of Wool.—The imports of sheep's wool into England in April was on a scale of great magnitude, having amounted to over 17 million pounds against 14,285,000 lbs. in the corresponding month last year. The deliveries from Australia in April were enormous, having reached a total of 13,163,000 lbs. against 7,206,000 lbs. in April 1863. The total imports, which in the first three months this year exhibited a decrease as compared with 1863, now present some indications of progress. The quantity of alpaca and llama wool received in the first four months of 1864 shows a slight decrease as compared with 1863, but there is a decided advance in the imports of woollen rags torn up to be used as wool. On the other hand the great progress in the exports of woollen goods, and the general activity in the home demand for this branch of manufacture are very striking; and there seems little probability at present of increased imports of raw materials having any influence on prevailing prices.

Gas Engine.—In the Exhibition of 1862, in the French department, was shown at work a small engine of this character, made by Lenoir, of Paris. Ordinary gas from the street mains is admitted, mixed with a certain amount of common air, into a cylinder with a piston working in it like a steam engine, and then exploded at each end by means of a spark from a voltaic battery, thus giving a backward and forward motion to the piston. The arrangement is said to be specially adapted for engines not exceeding 3-horse power. The amount of gas consumed per horse power per hour is 50 cubic feet, and this is mixed with common air in the proportion of one part gas to nine of air. The engine, when once set in motion, requires no further attendance, and no boiler or furnace is needed. Mr. Wiley, pen and pencil case maker, of Frederick-street, Birmingham, has just purchased one of these engines in Paris, where they are getting into extensive use, and it is the first brought into this country. Any person interested in the engine, it is understood may see it in operation by applying at the works of Mr. Wiley.

Colonies.

The Settlement in North Australia. — Three vessels have been dispatched, the *Henry Ellis* and the *Yatala* by the South Australian Government, and the surveying ship *Beatrice*, under the command of Captain Hutchinson, R.N., which is to co-operate especially in the matter of coast survey. The vessels are to rendezvous at Adam Bay, which is near the western entrance of Van Diemen's Gulf, the idea being that the most suitable site for a settlement will be found somewhere near or within the mouth of the Adelaide River. This locality is to be explored in the first instance, and if no suitable site can be found the coast is then to be examined to the southward. If this be determined on, the stock and stores are to be landed, and a depôt to be established pending the progress of further examination, so that at any rate there will be a temporary settlement in this locality, and those who are left in charge of it will have some experience of the climate. The coast line to the southward is known to be indented, but beyond that fact our knowledge is limited. There may be some fine bays, but if, after examining as far south as Victoria River, the right place cannot be discovered, the expedition is to return northward and examine the coast of Van Diemen's Gulf, and, failing any success there, is to prospect the coast as far as the Gulf of Carpentaria, avoiding Port Essington and Raffles Bay, but looking closely at the west coast of the gulf as far as the river Roper in Limmen's Bight.

Salmon.—The *Launceston Examiner* of the 23rd of June says: "A communication received a few days ago from Melbourne states that there were at least 3,000 young salmon swimming in the hatching pond, and it is satisfactory to know that every precaution has been taken to ensure the safety of the fry. But, though highly satisfactory so far, the enterprise cannot be said to have completely succeeded until we have our own breeding salmon, which will be from two to three years hence. To suspend operations for that time would be folly. Now that the packing of ova is ascertained, and the exact cost of its transport can now be calculated, it is very desirable that further shipments should be obtained for the next two years. By this means there would be a succession of fry coming on each year, until those first hatched are spawners. The ponds are already prepared, and the services of a skilled superintendent must be retained for a long time to come, so that the only expense will be that actually attending transportation, and probably it would not exceed £400. It is to be hoped that the young fish now in our ponds will arrive at maturity, but an unforseen casualty may carry them all off, and compel us to begin the enterprise afresh, with all the delay and disappointment that would follow. If the plan now suggested it will be a safe precaution, and will very materially hasten the stocking our rivers with salmon. We trust such a proposal will be submitted to Parliament, so that there will be ample time for obtaining a supply of ova at the approaching season.

Telegraph.—The telegraphic extension from Deniliquin to Hay (New South Wales), a length of eighty miles, was opened for messages on the 9th of June, having previously been inspected by the superintendent of telegraphs. Progress is being made with the extension from Wellington to Dubbo, and also with that from Braidwood to Queenbeyan; the latter line will soon be finished. The tender of Mr. D. Macquarie has been accepted for the extensions from Mudgee to Murrurundi, at a cost of £37 per mile.

Railways.—The *Sydney Herald*, 21st June, says: "The very severe and disastrous floods with which the colony has been visited during the past month have seriously interrupted the carrying out of the railway contracts; and we have consequently little to report respecting the progress that has been made with the new extensions. The continued rains not only put a stop to the works, but their effect on the roads must be for a time to render almost impossible the carting of materials to the lines. The contractors for the bridges at Penrith and at Singleton have suffered losses from injury to their plant; but otherwise, upon the lines in course of formation very little damage has been done to the works. The embankments have, of course, sunk considerably, but this had been provided for by their being kept above the required level. Considerable damage has, however, been done to each of the existing lines."

British American Territory.—The *Toronto Leader* says:—In point of territory British America under one Government would make one of the most extensive countries in the world. It is impossible to state the area with absolute accuracy, because many parts have been only imperfectly surveyed or explored; but it may, at all events, be taken that Newfoundland comprises 40,200 square miles (many persons believe the number to be much greater); Prince Edward Island is 2,173 square miles; New Brunswick, 27,105; Nova Scotia, 18,600; Canada (according to Sir W. Logan), 330,000; Hudson's Bay territory, 2,300,000, British Columbia, 200,000, Vancouver Island, 15,000, making together 2,933,078 square miles—a larger area than that of the United States (if there be such a country now), and approaching the size of Europe. The boundaries of British North America may be taken to exceed 11,500 miles. But if for the present the proposed confederacy stop short at the Red River, it would embrace a territory more extensive than those of France, Italy, Portugal, and Greece added together, and equal to Germany and Spain united.

Publications Issued.

Ce que peut Raconter une Grille de Fer de l'Influence des Femmes sur l'Architecture, etc.—(What an Iron Gate can tell of the Influence of Woman on the Architecture of the Eighteenth Century.) By César Daly. Paris.—This is a *brochure* by one of M. Vitet's slighted esthetics; in fact it purports to be a first instalment of Conversations on History and Esthetics. The title is quaint, but apt, although it may require a little explanation. M. Daly takes one of the beautiful gates of the railings that enclose the choir of Saint-Germain-l'Auxerrois, the church which faces the eastern *façade* of the Louvre, and analyses it, as it were, in order to show what a strange influence the effeminate manners and coquetery of the time of the later Louis had upon art, even religious art—how fashion pervaded the very sanctuary itself, and how such an able artist and workman as Dumiez, who designed and executed the whole of the beautiful work in question, in 1767, could so far depart from the rules of art, and so utterly disregard the fitness of things, as to ornament a screen in a Gothic edifice with all kinds of flowing scrowls, rosettes, bows, and true-lovers-knots, and, amongst other enormities of the same kind, to curve the tall and spear-like stalks of the lily with pretty flowing forms in accordance with the fancies and habits of an age which had no more regard for nature and true art than for anything else that did not belong to the realm of courtly taste. Upon this text M. Daly has written a very ingenious and esthetical discourse in a small compass.

Traité de la Fonte et du Fer.—(Treatise on Cast and Wrought Iron.) By M. Landrin. Paris.—The author of this work is a mining engineer, and he details the various processes employed in the manufacture of iron with considerable minuteness, the text being assisted by cuts interspersed in the letter-press and steel-plates. The volume is prefaced by a long and remarkable introduction, entitled the history of iron, and which is not unworthy of the subject.

Souvenirs de Voyage et Causeries d'un Collectionneur.—(Notes of Travels and Conversations of a Collector.) By M. Demmin. Paris.—This is a curious little book, and will be acceptable to *connoisseurs* visiting Germany. M. Demmin is an enthusiastic admirer of German Art, which he does not hesitate to place higher than that of Italy, especially as regards the earlier periods of the schools; he is also an industrious collector, and well acquainted with the bye-roads and labyrinths of the kingdom of Virtu. His book introduces the traveller to collections but little known to the public at large, and supplies curious information respecting dealers in works of Art and curiosities.

Notes.

College of Preceptors.—At the last half-yearly meeting of this corporation, the dean stated that the recent examinations had been conducted with the utmost possible regularity and impartiality. The numbers who came up for the pupils' examination, both in London and in country schools, had greatly increased. Besides the regular examinations by written papers, the college had been called upon to test a larger number of schools by oral examination. At the examinations for diplomas, seven ladies and nine gentlemen presented themselves for examination in various subjects. The report of the Council remarked upon the steady progress which the college had made during the last six months in all departments. The number of candidates at the recent examination had been larger by upwards of 100 than at any previous examination, and 220 more presented themselves than at the corresponding examination last year. The Council suggested that private schools should not manifest unwillingness to submit to inquiry, should a Royal Commission on middle-class schools be appointed. The Council reported that progress had been made since the last general meeting in the formation of the general committee, which is intended to represent the various associations of those who are more immediately interested in the scholastic registration question, as well as to comprise individuals well-known for their enlightened interest in education. and for their influence with the public on all questions connected with it. Enough has been done to ascertain that no effective opposition need be apprehended from the profession to such a measure as that sketched in the circulars issued by the Council. What is now required is the active support of those who are favourable to that plan, in order to overcome the *vis inertiæ* of government and parliament. During the last six months the diploma of Licentiate has been granted to four persons, and that of Associate to the same number.

Preservation of Meat.—Monsieur Pagliari, whose process for preserving meat by means of a coating composed of a liquid formed of alum-water and benzoin, described in Dr. Calvert's last lecture,* has just presented to the Academy of Sciences at Paris a modification of the process, which is stated to be very successful. He impregnates paper with this liquid, and makes it into bags, in which he places the meat. The Abbé Moigno states that he has had fresh-caught fish, thus packed, sent from the coast to Paris, which, notwithstanding the great heat, has arrived in excellent condition. The Abbé also enclosed some fresh meat in one of these bags, which has hung up in his study for eight days during the present hot weather, and this, when opened, was perfectly good and fresh. The liquid communicated no unpleasant taste to the meat.

Monsieur Runge gives the following process for the preservation of meat:—He takes an earthenware vessel, of convenient size, with a well-fitting cover, and at the bottom he pours 20 to 30 grammes of strong concentrated acetic acid, and places over it, at a distance of about five centimetres, a small grating made of wood, on which the meat is laid, and the lid is put on. The result of this arrangement is that the meat is surrounded by an atmosphere of acetic acid vapour, and is preserved from putrefaction for 12 or 14 days.

Aniline Colours.—The Industrial Society of Mulhouse have determined to award the Dollfus prize (a gold medal and six thousand francs) to Messrs. Perkins, Hofmann, Verguin, and Béchamp.

Destruction of Tumours by Galvanic Action.—M. Nélaton, whose reputation as a surgeon is European, has recently made a discovery, or rather applied a natural force, to the cure of one of the most painful forms of disease that afflict human nature, and he has just communicated the fact to the Academy of Sciences of Paris. The object is the destruction of tumours by means of the electric current. Polypi and other tumours formed in the natural cavities of the head and of other parts of the body are not only most painful, but their extirpation is attended with the greatest danger, especially when seated in the head. M. Nélaton has given a large amount of attention to this subject, and having arrived at the conclusion that all the means in general use were exceedingly unsatisfactory, resolved to try the effect of electricity. It has been long known that when two needles connected with the poles of a battery are placed in contact with the skin of the human body a slight destruction of the tissue occurs, but little importance was attached to the fact. M. Nélaton, however, conceived the idea of attempting to destroy tumours by inserting the needles in the parasitic mass, and placing them in communication with a powerful voltaic pile. In the first place he experimented on a dog, and he found that when two platinum points connected with a Bunsen battery of nine elements were

* See *Journal*, page 652.

inserted in the flesh there arose, after the current had been in action for eight or ten minutes, an induration of some extent around the positive needle and a corresponding softening of the parts round the other, with the formation of a white froth, composed of extremely minute bubbles of gas. After some other preliminary experiments, Dr. Nélaton had an opportunity of testing his new mode of operation, to which he gives the name of *électro-puncture*, in the case of polypus in the human subject. A young man, a tutor, nineteen years of age, entered into the family of M. Nélaton; he was suffering from a large vascular tumour in the roof of the mouth, which caused him great pain and inconvenience. All the ordinary modes of treatment had been tried without success, when Dr. Nélaton decided on making an experiment with the electric current. Two needles were introduced into the tumour, the pain was slight, and the white frothiness soon made its appearance. The action was continued for ten minutes. The treatment was repeated at intervals of eight and ten days, and maintained, after the first occasion, for only three to five minutes; the polypus began to diminish from the first application, and the patient was cured in four months, without loss of blood, and having suffered little pain. Dr. Nélaton has achieved few more imprtaont successes.

Club House for Artizans.—At Birmingham, on the 25th instant, an artizans' club house, which has been built upon the co-operative principle, chiefly by the men employed at the foundries and engine shops about Birmingham Heath and Smethwick, was opened in that locality. The club begins with a weekly subscription of 3d., and a quarterly one of 2s. 6d. Quarterly members alone will have the right of voting, and one bagetelle table will be observed exclusively for their use. The club will be open, to members only, every day (Sundays excepted) from eight o'clock in the morning until ten o'clock in the evening; and to its members the following advantages are effered:—Spacious, well-ventilated and lighted rooms, for smoking, reading, bagatelle, chess, draughts, dominoes, &c., &c., refreshments, of the first quality, at very reasonable prices; a reading-room, supplied with London and local papers, magazines, &c.; a library of standard and interesting works of fiction, history, biography, &c.; a lavatory, fitted up with every convenience; free attendance at lectures, reading, and classes, which will be organised at intervals during the year. There is also attached to the premises a gymnasium, with swings, jumping bar, climbing poles, &c.; an excellent quoit ground and skittle alley, in connection with which it is intended to establish clubs; and a capital rifle gallery. There will be classes for the study of advanced arithmetic, practical mechanics, and general and mechanical drawing, with English literature and composition. The committee are anxious to commence a glee and madrigal class.

Grant's Portable Railway.—Mr. Hubble, steward to Mr. Bannerman, of Barn Hill, Hunton, Kent, writes as follows:—" It may interest many of your readers to know that this railway was yesterday employed on the estate of H. Bannerman, Esq., in this parish, in carrying wheat to the stack, being, it is believed, the first work of the kind ever attempted by rail. A good crop was cleared off a six-acre field in the course of the day, and stacked in the field in a decidedly expeditious and creditable manner; the frequent shifting of the branch line and turntable being effected with remarkable ease and dispatch by one man. The tackle employed consisted of 60 rods of rails, two trucks with ladders, and two turn-tables. Although corn-carrying is not the kind of work for which the railway would be most useful in this district, where so little is grown, yet I feel it to be due to Mr. Grant, who has bestowed a very great amount of thought upon the subject, to state my conviction that the adaptability of the railway for carrying corn, as well as roots and manure, must be a most important consideration in the great corn and root-growing districts of the kingdom, especially on large holdings, where steam is used in the cultivation of the soil, and the horse-power of the farm is reduced to a minimum. Although the field in question inclined upwards to the stack, one horse only was employed to draw the two trucks coupled together. But it would very frequently happen in level districts that horses might be entirely dispensed with. As I have said, however, these considerations rather concern our corn-growing readers than the hop-growers of this neighbourhood, who are chiefly attracted to the rails by the power which their great bearing surface affords, of getting out manure, hop-poles, &c., at any season, without having to wait for a frost and of avoiding that injurious kneading of the soil which carting off the root crops so often inflicts."

Correspondence.

North London Working Men's Industrial Exhibition.—Sir,—The promotion of Exhibitions of Art, Science, and Manufactures is emphatically our province, for to the Society of Arts the civilised world is indebted for the establishment on a gigantic scale of the only series worthy of the name. To the example afforded by, and the experience gathered at, the Great International Exhibition of 1851, we are indebted for those of Paris in 1855 and at South Kensington in 1862, and of minor ones at New York, Dublin, Cork, and elsewhere. At none, however, of these, were skilled workmen specially invited to contribute the results of their talent and labour, for reasons sufficiently obvious, and prominently because they could not afford to expend the time and money such efforts would necessarily involve. But the time would now seem to have arrived when efforts in that direction exclusively are called for, and at all events exhibitions of native industry are being inaugurated by workmen themselves. Already one such exhibition has been successfully held at Lambeth, and another on a still more extensive scale is in process of establishment for the larger district comprised in the term " North London," and which it is intended to open on the 17th of October next, at the Agricultural Hall, Islington. For the promotion of this object large meetings of the producers and their friends have been held in suitable localities, the proceedings at one of which, in Amwell-street, Pentonville, where I had the pleasure of presiding, was reported in the last number of our *Journal*. I must candidly confess that until then (for I was unable to see for myself the contents of the Lambeth exhibition), the possibility of exhibitions limited to national and even local skilled workmanship was rather no than yes with me. What I heard and saw on that occasion; the intercourse I have since had with persons directly interested in the movement; and what I hav read on the subject, have removed any doubts I may have previously entertained. You will see by the enclosed programme that these workmen have gone about their great project in a workmanlike way.* They have sought and obtained the patronage of well-known influential gentlemen, principally residents in the North London district, and have established a central committee of persons well known in most of the departments of scientific and art workmanship. The precise objects of the proposed exhibition are succinctly set forth, and rules and regulations for the guidance of intending exhibitors are drawn up with a true mixture of care and common sense, which cannot be misunderstood or fail to ensure success if rigidly enforced. The response has been most gratifying. One of the hon. secretaries, Mr. Ratley, informs me by letter, that " this experiment, for it is nothing more, is attracting public notice in a very extraordinary way;" and then proceeds to furnish some illustrative instances, unnecessary to quote, but fully bearing out the statement. The principal difficulty is how

* An abstract of this programme appeared in the Society's *Journal* a few weeks since, p. 592.

to meet the applications for information and space in the short time before the exhibition opens, especially considering that both the central and local committees are mostly composed of persons whose time is money and food to themselves and their families. "Every day," says Mr. Ratley, "brings us claimants for space of something curious or artistic." But besides this difficulty there is that preliminary one of the ways and means. Towards the solution of this, the promoters have wisely adopted the example of the Council of our Society in 1862, and invited guarantees principally amongst themselves for small sums, but not objecting to external help in the same way. The probability of such guarantors being ultimately called upon is very remote; nevertheless, it is a precaution which as men of business it was their duty to take. There is also another mode in which the friends of skilled workmen may more directly assist, but which I have some hesitation in suggesting. A letter was sent to me yesterday, from a not very well-to-do working man, anxious to exhibit what he describes as "a very useful article for poor people, viz., a portable oven, which could be sold very cheap; it is to bake on the top of a stove over a common fire." He is however unable himself to get it cast, as he has "but little employment, and it would cost about 30s." This case explains what I mean, and serves to show that if a fund were raised for the purpose of assisting in this and similar cases, the proper application would require great care and discrimination. In most cases of real industrious talent, the employers of labour are ready to assist, but there is the danger of weakening that sense of self-dependence which is so essential to self-respect. It cannot be doubted, however, that cases do exist in which no such danger need be apprehended; whether my correspondent, the inventor of an economic oven, is one of them, or whether there are other ingenious and honest men similiarly situated, I am not in a condition to affirm—I merely throw out the hint. I have only further to say at present that this experiment is, as Mr. Ratley says, exciting great interest, not only in the district of North London, but in other industrial metropolitan localities, and even in large manufacturing towns, such as Birmingham, and others of corresponding importance. If it is as successful as we must all wish it to be, there cannot be a doubt that it will be largely imitated, and probably lead, at no distant period, to a National Industrial Exhibition, which will supplement and be scarcely less attractive than those great International Exhibitions, to the eminent success of the first of which—that of 1851—our late lamented Prince Consort so influentially contributed.—I am, &c., Thomas Winkworth.

Canonbury, Aug. 31, 1864.

Patents.

From Commissioners of Patents Journal, August 26th.

Grants of Provisional Protection.

Anchors, construction of—1946—G. F. Druce.
Animal substances, preservation of—1570—A. Hett and F. W. Bassett.
Atmospheric pressure, raising, lowering, &c., by—1281—J. E. Holmes.
Ball valves—1972—J. Lessware.
Bracelets, chains, &c., manufacture of—2021—J. B. Buffoni.
Cartridges, holder for—2011—A. H. Williams.
Coating surfaces, composition for—1496—T. J. Hughes and W. H. Hotten.
Colouring matters, manufacture of—1994—C. Lowe.
Cotton fabrics, making non-inflammable—1937—B. O'Connor.
Cotton, silk, &c., rendering uninflammable—1957—E. Hottin.
Curtain hooks, &c., manufacture of—1889—J. Nicklin.
Cylinders, pipes, &c., manufacture of—1954—M. Henry.
Doors and gates, self-closing—1915—T. Newby and C. Smith.
Eggs, apparatus for cooking—1970—J. H. Johnson.
Elastic recipients—1982—W. Clark.
Electro-gilding—2029—S. Moore.
Fibrous substances, preparing, spinning, &c.—1890—W. Anderton.
Glass surfaces, gilding of—1989—J. H. Johnson.
Hats, caps, bonnets, &c.—1886—H. Freystadt.
Hats, fittings for suspending—1900—W. Payton and J. Stanley.
Hats, stiffening or proofing—1922—W. Barber.
Inflammable air, apparatus for generating—1950—G. F. Marchisio.
Iron ships, preventing the bottoms from fouling—1962—C. Bartley.
Liquids, measuring the passage of—1977—W. Richards.
Looms—1976—D. Speirs, A. Boyd, J. Aitken, and M. Gilmour.
Looms—1980—J. L. Norton and W. Ainsworth.
Masts and spars, tubular—1884—T. Moore.
Mill straps, &c., preparation of leather for—1952—J. Lee.
Motive power—2025—A. C. Pilliner and J. C. Hill.
Motive power, lever machines for obtaining—1992—R. A. Brooman.
Musical box and albums, &c., combined—1919—F. W. Bossert.
Paper, &c., preparation of fibres for the production of—2003—J. Adam, J. Webb, and J. J. Monteiro.
Projectiles—1960—C. W. Lancaster.
Railway carriages and breaks—1953—I. Farrell.
Railway carriages, passenger safety signal for—1990—R. Pepper and A. Barr.
Railway rails, fastenings for—1938—M. A. Soul.
Railway sleeper—2027—R. Cordner.
Railways, permanent way of—1882—J. Livesey and J. Edwards.
Railway trains, communication between one part and another—2045—T. Turner.
Railway trains, communication between passengers and guards—1924—M. Woodifield.
Railway trains, communication between passengers and guards—1974—T. F. Cashin.
Railway trains, communication between passengers and guards—1979—A. Turner.
Railway trains, communication between passengers and guards—2023—J. Dilkes and E. Turner.
Railway trains, communication between passengers and guards—2035—T. Morgan.
Screw bolts, manufacture of nuts for—1948—F. J. Bramwell.
Seeds, apparatus for cleaning—1984—W. Mason.
Smoke, consumption of—1964—W. Brookes.
Steam boilers or generators—1986—G. Davies.
Steam engines, automatical regulator for—1968—M. Runkel.
Stick lac, treatment of, for the manufacture of shell lac, &c.—2033—E. A. Pontifex.
Stoves, gas heating or cooking—1602—C. Denis.
Telegraphic apparatus (domestic)—1405—W. H. Preece.
Tin and terne plates, manufacture of—1956—G. Leyshon.
Traction engine, construction of—1978—M. Payne.
Weaving, preparation of warps for—1988—H. Armistead.
Weaving, reeds and healds used in—1848—J. C. Ramsden.
Woollen fabrics (army cloths)—1958—W. Stott.

Inventions with Complete Specifications Filed.

Fire-arms, &c., breech-loading—2059—B. Burton.
Military outfit, protection of—2051—L. Yvose-Laurent.
Oleaginous seeds, extracting oil, &c., from—2076—G. G. Boggio.

Patent Sealed.

261. J. Whitworth.

From Commissioners of Patents Journal, August 30th.

Patents Sealed.

506. C. G. Hill.
507. W. H. Mellor.
514. E. Humphrys.
515. E. T. Hughes.
516. J. Wild.
522. G. Davies.
528. F. P. Langenard.
532. J. Wright.
537. B. P. Stockman and J. S. Scott.
539. S. Pritchett.
540. G. T. Bousfield.
541. G. P. Harding.
542. W. Ibotson.
544. D. Slater.
551. S. Bourne.
553. F. Smith.
557. L. Hill.
559. W. G. Beattie.
562. C. Humfrey.
563. T. Gray.
565. C. Jordan.
566. J. Revell.
569. J. Price and R. E. Donovan.
570. C. E. Laederich.
572. W. Moir and C. E. Serjeant.
614. F. Wilkinson and W. Rossetter.
622. J. Taylor.
627. R. H. Collyer.
641. J. Newey.
686. W. Clark.
687. W. Clark.
796. R. Ferguson and W. Lattimer.
801. J. G. Beckton.
1128. J. Thompson.
1178. A. V. Newton.
1219. R. H. Hughes.
1232. J. Womersley.
1376. W. E. Newton.
1486. R. Whiteside.
1534. J. Holmes.
1564. G. Haseltine.
1623. H. A. Bonneville.
1676. W. E. Gedge.

Patents on which the Stamp Duty of £50 has been Paid.

2108. S. Elson.
2281. J. B. Howell.
2116. W. Clissold.
2179. J. M. Dunlop.
2123. G. Nye.
2000. G. Parry.
2185. W. Clark.
2133. L. M. F. Patureau.
2141. J. Ronald.
2143. W. S. Guinness.
2162. J. S. Matthews.
2171. P. Taylor.

Patents on which the Stamp Duty of £100 has been Paid.

2250. J. Penn.
2251. J. J. Tucker & G. Blaxland.
2285. H. Brinsmead.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, SEPTEMBER 9, 1864. [No. 616. Vol. XII.

TABLE OF CONTENTS.

Announcements by the Council.

Examinations, 1865.

The Programme of Examinations for 1865 is now ready, and may be had gratis on application to the Secretary. A copy has been sent to each Institution and Local Board.

Proceedings of the Society.

EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 664.)

ENGLISH HISTORY.

THREE HOURS ALLOWED.

1. What were the principal divisions of Britain in the ninth century?
2. Explain frank-pledge, folc-land, socage, alod, escuage, tallage, subsidy.
3. Give, with dates, a short history of the reign of Henry III.
4. Write a short life of Becket, *or* of Wolsey, *or* of William III.
5. What were the chief articles of the Petition of Right?
6. Compare the powers of the crown in the reigns of Edward III., Elizabeth, Charles II., and Anne.
7. What was meant by the "dispensing power" of the Crown? Give instances of its abuse, and state whether it has been abolished.
8. Give a short history of the Puritan party.
9. What were the chief Acts passed in the reign of Charles II?
10. Describe the trial and execution of Lord Stafford.
11. Write a short life of Sir Robert Peel.
12. Describe minutely any one battle.

ENGLISH LITERATURE.

THREE HOURS ALLOWED FOR THE TWO AUTHORS SELECTED BY THE CANDIDATE.

Chaucer.

(Prologue to the Canterbury Tales.)

Section I.

1. A good man was ther of religioun,
And was a pore persoun of a toun;
But riche he was of holy thought and werk.
He was also a lerned man, a clerk
That Christe's gospel gladly wolde preche;
His parischens devoutly wolde he teche.
Benigne he was, and wonder diligent,
And in adversite ful pacient;
And such he was i-proved ofte sithes.
Ful loth were he to curse for his tythes,
But rather wolde he geven out of dowte,
Unto his pore parisschens aboute,
Of his offrynge and eek of his substance.
He cowde in litel thing han suffisance,
Wyd was his parisch and houses fer asondur,
But he ne lafte not for reyne ne thondur,
In siknesse ne in meschief to visite
The ferrest in his parissche, moche and lite,
Uppon his feet, and in his hond a staf.
This noble ensample unto his sheep he gaf,
That ferst he wroughte, and after that he taught,
Out of the gospel he the wordes caughte,
And this figure he addid yit therto,
That if gold ruste, what schulde yren doo?

(*a*) Express the sense of this passage in prose, by changing every obsolete expression for a modern one, and putting the words in each sentence into their simple order, so as to add as little as possible to the number of the words.

(*b*) Select each word which requires to be pronounced differently from modern usage to make out the verse, and mark how it must be sounded.

(*c*) Explain each peculiar construction.

2. Give a short account either of the Nun, the Knight, or the Pardoner, using any of Chaucer's own words which you can recollect.

3. Explain these words—*achatour, somdel, forby, algate, acate, vernicle, yelwe, altherbest, everichon.*

4. In what respects does the grammar of Chaucer mainly differ from modern usage?

Section II.

1. Sketch the general plan of the Canterbury tales.
2. Name the other principal works of Chaucer.
3. What is known of Chaucer's early life?
4. Who were the most famous writers in English who lived in the same century as Chaucer, and which were their chief works?
5. Give some account of the sources from which Chaucer took many of his stories.

SHAKSPERE.

(KING LEAR.—RICHARD II.—THE MERCHANT OF VENICE.)

SECTION I.

(a) My wind cooling my broth
Would blow me to an ague, when I thought
What harm a wind too great might do at sea.
I should not see the sandy hour-glass run
But I should think of shallows and of flats;
And see my wealthy Andrew dock'd in sand,
Vailing her high top lower than her ribs,
To kiss her burial.

(b) O reason not the deed: our basest beggars
Are in the poorest things superfluous:
Allow not nature more than nature needs,
Man's life is cheap as beast's.

(c) O, who can hold a fire in his hand
By thinking on the frosty Caucasus?
Or cloy the hungry edge of appetite
By bare imagination of a feast?
Or wallow naked in December snow
By thinking on fantastic summer's heat?

(d) Needs must I like it well; I weep for joy,
To stand upon my kingdom once again.
Dear Earth, I do salute thee with my hand,
Though rebels wound thee with their horses' hoofs.

(e) —This is some fellow,
Who, having been praised for bluntness, doth affect
A saucy roughness; and constrains the garb
Quite from his nature—

(f) How far that little candle throws his beams!
So shines a good deed in a naughty world.

1. In what connexion does each of the above passages occur?
2. Express the sense of *a*, *b*, and *c* in simple prose as briefly as you can.
3. Notice every old word, or word used in an obsolete sense, and every peculiar construction.

SECTION II.

4. Compare the characters of Kent and Glo'ster; or those of Richard II. and Lear.
5. From what sources did Shakspere take the stories of King Lear and the Merchant of Venice.
6. What deviations from historical fact are there in Richard II.?
7. State what you know of the history of the texts of these three plays.
8. Give some account of Shakspere's life before he went to London.

BACON.

(ESSAYS.)

SECTION I.

1. Give the substance of the essay, "Of Simulation and Dissimulation." How far do you agree with the principles expressed in it?
2. Explain the following passages, and notice anything which is peculiar in the words or constructions:—

"In place, there is license to do good and evil; whereof the latter is a curse; for in evil, the first condition is not to will; the second not to care."

"Princes are like to heavenly bodies, which cause good or evil times, and which have much veneration but no rest."

"Glorious men are the scorn of wise men; the admiration of fools; the idols of parasites; and slaves of their own vaunts."

3. How does Bacon distinguish between *goodness* and *goodness of nature*?
4. Give an outline of the essay "Of Envy," or that 'Of Seeming Wise."
5. "The Kingdom of Heaven is compared, not to any great kernel or nut, but to a grain of mustard seed, which is one of the least of grains, but hath in it a property or spirit hastily to get up and spread." What use does Bacon make of this illustration?
6. "To seek to extinguish anger utterly, is but a bravery of the Stoics." Explain these words. What cautions are given in the essay in which they occur for the due restraint of anger?
7. Explain Bacon's use of the following words—*zelant, tracts, vein, regress, percase, oes, meliority, laudatives, knap, imbase, coemption, chapman.*
8. Give some of the words of very common occurrence which were used in a different sense in Bacon's time from that in which we use them.

SECTION II.

9. Name the principal works of Lord Bacon.
10. Give an account of the first publication of the Essays and of the most important editions of the work.

CRAIK.

(OUTLINES OF THE HISTORY OF THE ENGLISH LANGUAGE.)

1. "Most commonly the effect produced by one language upon another is confined to the vocabulary. It is very rarely that two distinct grammatical structures become intermixed." Show the bearing of this statement upon the history of the English language.
2. Give some account of the two great dialects of the French language at the time of the Norman Conquest. In what way did each influence the formation of the English language?
3. State the historical doubts regarding the Jutes.
4. Illustrate, by means of a table, the relation in which the Gothic languages stand to each other.
5. To what classes do those words belong which the English language has taken directly from the Latin? Give examples.
6. Explain the term *Semi-Saxon* and give an account of Layamon's Brut.
7. In what respects did the early English mainly differ from the Semi-Saxon? What is the Ormulum?
8. In what way did the use of French become extinct in England?
9. What particulars chiefly distinguished the grammar of the middle English from that of modern English?
10. Explain the terms — *Danelagh, Limes Saxonicus, Lingua Franca, Romance, Romaic, Neo-Latin.*

(To be continued.)

Proceedings of Institutions.

PEMBROKE DOCK MECHANICS' INSTITUTE.—The fourteenth annual report, to July, 1864, states that in the condition of the Institute there is a steady improvement; the total number of members at present is 285, showing an increase of 13 during the last twelve months. Upwards of 60 members have, since 1862, kindly volunteered an annual subscription of two shillings, in addition to their regular subscription, amounting to £16 2s. 6d., to be devoted entirely to the building fund. In reference to the annual examination in connection with the Society of Arts, the Committee state that the number of candidates for this year, and also the number of certificates obtained by them, are in excess of former years, testifying to the increasing interest taken by the members in these most impartial educational tests; and, if an educational scheme, in connection with the Institute, were properly developed,

a still further increase in the number of candidates would ensue. Eighteen certificates were awarded to the ten members who passed the examination this year, one of whom succeeded in gaining the first prize in geography. Intending candidates are informed that a selection of the text books, recommended by the Society of Arts has been added to the library, and their attention is specially called to the Examiner's remarks in the *Journal* for the week ending June 24th; and further information may be obtained on application to any of the members composing the local board.

GAOL DIETARY—THE OPERATIONS OF THE RECENT COMMITTEES.

By EDWARD SMITH, M.D., LL.B., F.R.S., Assistant-Physician to the Hospital for Consumption, Brompton.

(*Continued from page* 670.)

WHAT THE COMMITTEE HAVE DONE.

So far I have regarded the operations of this Committee negatively, and have quoted their statements as to the parts of the inquiry which they have left undone. I now proceed to show what has been done.

The Committee state, on page 24, "that we do not hope to obtain any information applicable to our purpose from direct experiment. But what we cannot get from experiment we may hope to arrive at by experience." This is the ground on which they have proceeded, placing on the one hand *experiment*, or as they elsewhere state *theory*, and on the other *experience;* on the one hand precise knowledge, if they had known how to obtain it, and on the other common observation, with all its gradations of trustworthiness, instead of using experiment for the purpose of acquiring scientific information on subjects with which science alone could deal—as the effect of confinement and the necessity for certain ingredients in the food, and the experience well selected as to the general effect upon health and strength.

The first step which they take is to *assume* a basis for the dietaries, viz., the fitness of the present scheme of dietary. After commenting upon the dietaries of 1843, and stating (p. 27) that it is quite impossible to study this table without coming to the conclusion "that Sir James Graham did unconsciously introduce a strong penal element into classes 1 and 2, and a slight element of luxury into class 5," and after stating on page 28 "they are strangely anomalous and eminently unsatisfactory," they add to the first sentence their conclusions—"We shall to a certain extent take them as our guide. We shall assume that criminals sentenced for short periods of imprisonment are not only to have less food than those sentenced to longer periods, but that the food ought to consist of few elements, and those not of the most attractive character." They *assume* as their starting point that there shall be different scales of dietary in prisons, which must mean, if it have any scientific value, that they *assume* that there is an effect in confinement which demands increase of food as the imprisonment endures. But such a fact cannot be allowed to rest upon an assumption; it is the very fact which Sir George Grey informed them was to be proved by experiment. Having then assumed that there should be different scales of food, it was an easy matter to assume that the existing plan of five classes was the right one, and they at once adopt it, and thus place on *assumptions* the whole framework of the scheme of dietary.

The next step was to appeal to *experience*, as they state, and a series of questions was drawn up Dr. Guy and forwarded by the Home Office to the Visiting Justices of Prisons to ascertain the dietary in use, and their views as to its fitness, and he appends a list of diseases which he states are "usually ascribed to insufficient diet."

The schedule which is annexed is based upon the Government scheme with its five classes and defined durations of improvement, and no provision was made for returns upon any other scheme. This at once indicated that the framers were quite unacquainted with the system pursued in county and borough gaols, for in the return, entitled "Dietaries for Convicts, &c.," issued by the Government in 1857, out of eighty-six county gaols forty did not conform to the Government scheme, either in number of classes of dietaries, or in the different durations of imprisonment to which each class was appropriated. How then could any return be made by these non-conforming gaols in the schedule forwarded to them? It is also stated by the Committee, that of one hundred and forty county and borough prisons sixty-three still use, with approval or disapproval, this scheme, but I believe this number included some gaols which, having accepted the scheme of diet, have varied the duration of imprisonment attached to them, and so far are non-conforming. Hence it follows that no accurate returns could have been made upon the schedule from one-half of all the gaols in the kingdom, and if they had been made in any other mode, they could not have been analysed with those of the conforming gaols.

The statement as to the diseases which they say are ascribed to insufficient diet is *theoretical* enough. Thus diarrhœa, which is a seasonal disease or due to improper and excessive food; dysentery, which is almost unknown in this country; scurvy, which has almost universally disappeared; scrofulous enlargements, which depend upon constitutional taint; boils and carbuncles, which occur among rich and poor alike,—are cited as such diseases, and this in reference to dietaries which extend over so short a period as from seven days to twenty-one days, for in these alone can there be any grave suspicions of great defect in food. Such questions could never have been proposed by one familiar with the short sentences in county gaols, however singularly they may have occurred to one accustomed to the long imprisonments in convict prisons, and unduly impressed with the historical fact of an outbreak of scurvy which occurred at Milbank forty years ago. The only question which has any value in it is that of general failure of health and strength; but it must occur to every mind, that so general a condition must be one very difficult to define—impossible in the short period to which the lowest class of dietaries refer, and to Visiting Justices, who are required by law to see the prisoners three times in a year, or to surgeons who do not devote their whole time to the duties of the gaol, and whose visits in the absence of evident disease would be little more than formal. Such an inappropriate list of questions could only be answered negatively, and no information showing the sufficiency or insufficiency of the dietary could be derived from them.

The Committee were directed to frame dietaries "which should be sufficient and not more than sufficient for the maintenance of health," and instead of finding the proof which the conditions require, they hand on the exact words to the Visiting Justices, and, after seeking their opinion, ask if any of the dietaries in use in the particular gaol are, in their opinion, more than sufficient or insufficient for that purpose; and upon the replies to these questions, the whole report and the whole procedure (after the *assumption* of a basis as above stated) of this Committee is based. Not one proof do they themselves work out—not one subject do they explore—not one fact do they of their own labour add to knowledge; so that the Visiting Justices of Prisons are accepted as the highest authorities on the dietary questions in prisons, and on their views alone is the existing scheme to be maintained or a new one devised. If this had been the view held by the Committee of the House of Lords, or by the Home Secretary, it would not have been necessary to recommend the appointment of a Commission, which was intended to have included in it the best informed men of the day upon an abstruse and eminently scientific question; neither need Sir George Grey have selected medical men, whether specially acquainted with the subject or not, for no talent

was required to draw up a series of questions such as those proposed to the Visiting Justices, and a clerk would have been far more fitted to have analyzed the replies.

It would be idle to stay to show that the Visiting Justices have no claim to, and would repudiate this position, and would at once defer their views on the scientific aspects of the question to those whose scientific training and medical education alone fit them to undertake such a work. But it may be added, that the opinion of the medical officers of the different gaols was also sought, and that they are competent to advise, and would guide the Visiting Justices. The medical officers are referred to only incidentally, and considering that the questions were framed by medical men, I may add very superciliously. No direct reference was made to them—no questions were proposed to them, nor was any schedule forwarded to them by the Committee, but the remark is appended to the questions addressed to the Visiting Justices:—"You are requested, before answering these questions and filling up these forms, to consult with your medical officer, who will state whether he concurs with you in the answers given." Notice the secondary part which the surgeon is asked to play—the opinion of the Visiting Justices on dietary is of so much value that questions are specially addressed to them; but that of the medical man whose education has had reference to this very subject, and to whom the Justices must look for advice on questions of health, is of so little moment, that it is left to the Justices to ask for it or not at their discretion. A medical man having a right view of his own position would decline such a reference; or, taking lower ground, would hesitate to express an opinion adverse to that of the chairman of the Visiting Justices who might choose to ask his concurrence.

If, therefore, with the present defective arrangement in gaols, by which a medical man in general practice is appointed the medical officer of gaols, and can devote only so much of his time and attention to the prisoners as may be necessary to treat their diseases, the opinion of such medical officer could not command implicit faith, the mode in which this Committee have thought fit to ask for it deprives it of any value apart from that of the Visiting Justices. It would be interesting to learn in what proportion the surgeons to the 140 gaols have expressed an opinion adverse to that of the Visiting Justices.

It is impossible to discuss with any satisfaction the analysis of these returns, which constitute the body of the report, without having the details upon which the analysis is founded, for it follows from the large number of non-conforming gaols, that the analysis must have been made upon returns which could not be treated in one analysis, and that the results are erroneous, or that the analysis has been made upon the experience of only a part of the gaols. In the analysis of the separate classes, which commences on page 35, only a minority of the gaols is included, for in the first class only 24 prisons are cited, whilst the non-conforming gaols amount to from three to four times that number. Yet upon such an analysis the results are founded, as in the very class in question (class 1, bread and gruel dietary), in which the Committee state that "a glance at the table will show that the diet in this class is more frequently deemed defective than excessive, and that where additions are made they are often on a very liberal scale."

The analysis of the returns as to the question of diseases, which the Committee say are attributed to defective diet, states, that the question as to general failure of health and strength (the word "general" being there italicized by the Committee) was, "by a majority," "answered in the negative;" that as to boils and carbuncles "may be at once dismissed;" scrofulous diseases were also "comparatively of rare occurrence;" diarrhœa "furnishes no indication that the dietaries are deficient or defective;" scurvy (on which and its supposed preventive, potato, the Committee is great) had "formerly" occurred or "seldom" occurred in eight gaols so long ago as 1845 or 1847, or "formerly occurred," or occurred "some years since," but, as must have been expected by any one acquainted with our present public dietaries, does not now occur; yet the Committee take credit for the forethought which dictated the inquiry, for they state, "Among the diseases which have been attributed to deficient or defective food, *scurvy* holds the first place, and we were, therefore, prepared to expect important information from the return under this head. We have not been disappointed. The above is the "important information" which they state they have received; and as the returns have shown that no scurvy exists under the present scheme, they recommend an addition to the "potato element" in their new scheme dietary!

The analysis of the returns on the question of health and strength is extended, and yet out of 140 gaols the replies of only 19 gaols are cited, some affirming and explaining, others denying the occurrence. Hence the result of this series of queries is as unimportant as the value of the queries would have led us to expect.

The subject of loss or gain of weight is discussed at length, but with exceedingly few data, and the analysis is made upon an erroneous assumption of the present opinion upon the value of weight, for it is clear that variations in weight under a given dietary will occur with age—the period of growth—weight on entering the prison—the labour exacted—the varying effect on the spirits and health by imprisonment—the power of digestion and assimilation of a given and probably unusual dietary—the season of the year, as proved by Mr. Milner, *as well as* the quantity of food which is supplied. Yet the Committee begin their remarks by the statement: "As the weight of prisoners is believed to supply a very precise and definite test of the sufficiency of our dietaries;" and having thus set up a test which nobody allows to be without fallacy, they easily find returns which show its untrustworthiness. Yet even here a very small minority of the gaols—only 6 out of 140—are thought sufficient for the discussion, and from these they show "that weight of body varies with work performed, with the diet supplied, with the weight of body on entering the prison, and with short as well as long periods of imprisonment." They also import into the argument certain isolated and exceptional results, as that at Millbank (which is not a county gaol, and in which the conditions are quite different from those of county gaols) there was gain and loss alternately. At Pentonville (also not a county gaol) and Glasgow there was no relation of weight of body to increase, decrease, or change of diet. (We might ask if these changes were without limit, and if there would have been any decrease of weight if the prisoners had been kept without any food, or increase if fed at an aldermanic feast?) At Wakefield those lost most who had the best diet (but all lost). At Liverpool there was a gain during the first month and a loss during the second month, and at Wakefield there was a loss over the whole twelve months.

Hence, omitting reference to the convict gaols, they quote certain returns from five county and borough prisons, viz.: Morpeth, Wakefield, Hereford, Manchester City, and Liverpool: Wakefield showing a loss in the whole twelve months; Hereford a loss in the majority on the lower and gain on the higher classes of dietary; Manchester in 1864, with the distressed operatives abounding, showing some anomalies such as stationary weight on the lowest diet—this is for persons condemned for the short term of seven days, and decrease with the better dietaries, and different class of offenders, in the second and third classes, and increase in dietaries four and five, and in a supplemental return an actual increase in class two, but decrease in the higher class three; Swansea with a general loss in the low dietaries, and Liverpool with a gain on the lowest, a loss on the second, a gain on the higher dietaries.

Hence in these returns there is a general agreement in loss of weight with the low and gain in weight with the higher dietaries; and when there is a general gain of

weight with the lowest dietary, as occurred at Manchester and Liverpool, it is manifestly exceptional, and is found in the two towns quoted with multitudes of ill-fed youths committing small crimes and suffering a few days' imprisonment. The general result of the analysis is to throw doubt upon the value of weight as a test of sufficiency of food; and whilst the Committee point out that heavy or light weight on admission, "corresponding doubtless in fact to difference of age," seems to have more influence in the gain or loss of weight than any other cause," and also show that "original equality of weight, of age, of residence in prison, of employment, and of discipline, are necessary conditions of any scientific comparison of one diet with another," they do not attempt to isolate these different classes of cases—have not obtained any new returns or made new experiments whereby they could have been separated, and the real influence of food over weight of body properly ascertained—have left the matter just as they found it, but do that which is almost equivalent to a depreciation of important evidence, for after giving great prominence to the returns from Manchester and Liverpool, with their anomalies, and after having included only five gaols in the analysis, they add in a single sentence—"though it does undoubtedly happen that some small groups of weighings which have been forwarded to us from the prisons of Peterborough, Stafford, Swansea, Winchester, Preston, Bury St. Edmonds, and Exeter, show a loss of weight in almost all the prisoners placed on the diets of the shorter sentences, with a marked gain of weight as the rule of the longer terms of imprisonment." Hence the anomalous results in two or three gaols—the general results, however, conforming—have a higher value than the returns from seven other gaols quoted, for the latter only "undoubtedly happens." Their final conclusions are, that "seeing then that the test of weight fails to a certain extent, it is obvious that we must make use of it only as one among several indications of sufficient and insufficient diet;" and again, "that gain or loss of weight is not to be trusted to as a test of the sufficiency of the dietaries." This may be true of individual cases; but on their own showing it is not correct in the aggregate, even in the gross and unsatisfactory way in which weight at different ages, &c., is taken, and certainly could not be true if the cases were selected into classes in the manner in which they have pointed out, *but not carried out.*

In judging of the value of dietaries this Committee have followed the precedent which its chairman adopted when he gave evidence before the Royal Commission and the Lords' Committee of last year, and which, enlarged and varied, he read at the Statistical Society, and published as a separate pamphlet for distribution—that of the gross weights of solid and of liquid food—from which it follows that as solid food is more uniform in its character than liquid food, and the latter cannot in that form be compared with the former, the real comparison of diets is made on the solid food alone, and valuable fluids as gruel, with oatmeal and treacle, milk and soup, are virtually left out of the calculation. A striking example of this evil is furnished by the very dietaries which this Committee have framed, as I shall presently show.

It is evident in a moment that to class together potatoes and meat, and bread and cheese, and estimate their value by their weight, as if they were one kind of food, is contrary to the sense of a child; and to omit reference to four ounces of oatmeal and three-quarters of an ounce of sugar or treacle in a day's supply of gruel is yet more absurd. It is true, that the mass of non-medical persons know of no other mode of computation, and with such the plan may be in some measure excused; but at this day for medical men, and much more for scientific men, to us it, is altogether inexcusable. I am quite aware that the composition of food, and the mode of calculating the nutritive elements, is not universally known to medical men, and that the subject is abstruse and uninviting, but for some years past no chemist or physiologist has ventured to compare foods otherwise than on their chemical composition; and if gentlemen undertake to be authorities on dietary questions, it is surely little enough to ask them to make themselves familiar with the composition of food, or at least, to use tables of the constituents of foods, which may be readily obtained. I am informed that efforts are made to impress upon the minds of official men, and of influential members of the Houses of Parliament, that the composition of food is theoretical and inexact, and consequently that all calculations based upon it must be untrustworthy; and as the public is not familiar with such terms as carbon, hydrogen, nitrogen, &c., such doubts are for the present received. The Committee adopt something of this view, and depreciate the modes of calculation used by Liebig, Playfair, Lehmann, and by every chemist and physiologist of the day. They say (page 59), "The question whether the sufficiency of the dietaries of 1843 can be tested by the quantities of carbon and hydrogen assumed to be necessary for the support of the body is one of the utmost importance in its relation to the present inquiry, for if this test could be shown to be sound in itself, and really applicable to this purpose, the work of this Committee would receive the stamp of authority higher even than that of the experience upon which we intend to found them."

It is this very kind of inquiry which was required in order to determine the effect of confinement, of hard labour, and of other elements of prison discipline upon the prisoners, and which this Committee stated that they could not ascertain. Had they ascertained by exact research the amount of carbon and nitrogen which kept the body in health and strength under the different conditions of prison discipline, they would have given us that which we require, or as Professor Sharpey writes, "We are sorely in want of trustworthy data to show the absolute quatities of carbon and nitrogen indispensable for health under different circumstances—that is, data derived from experiments on human alimentation." Such experiments have been made by many, but in prison dietaries only by myself; and what is required is an extension of them to all the conditions under which dietaries are used. The method is simple and sound, and Professor Sharpey again writes, "I cannot doubt the soundness of the principle in which you propose to determine the digestibility of food in the case of persons in confinement, viz., by ascertaining what proportion of food passes from the body unused." The method is also known, and the results hitherto obtained are recorded in the *Phil. Transac.* and in the Transactions of the *Brit. Assoc.*, and the method could have been employed by the Committee, or by the aid of qualified persons. Such, however, was not their plan—they place what they call "experience" before observation.

At this point they do me the honour to refer to my labours in this field; misrepresenting my statements, and then seeking to throw ridicule upon them. I am made to say that I consider 30,100 grains of carbon and 1,400 grains of nitrogen weekly—which, when advising the Government last year, I stated to be necessary for the Lancashire operatives—as a proper quantity for prison discipline; and they then proceed to show its fallacy by supposing that in dietaries which afford less the prisoner should lose, and in those which afford more the prisoner should gain weight, and in exact proportion to the defect or excess, and over any number of days or weeks that the excess or defect is continued.

I will not occupy time in discussing the question, but will say that I have never mentioned any quantity as suited to prison dietaries, and so far from my having made such a statement as they impute to me, I expressly added in the paper from which they quote (*Journal of Society of Arts*, Feb. 19, 1864) that crank labour requires 45,000, and tread-wheel labour 60,000 grains of carbon weekly;

and in my evidence before the Lords' Committee I stated my inability to frame any prison dietaries upon a sound and final basis until further information had been obtained by experiments in prisons. Having, however, set up this standard and test, they proceed to quote the experiments on weight at Hereford, Manchester, and Liverpool, beforementioned, to show that the result which they assert ought to be found, did not occur either in any degree or in the degree which they affirm to be needful. Yet, as already stated, even these, in a general sense, show that there is a gain in weight in the higher, and less in the lower dietaries—the dividing line being about the quantity which I named for the Lancashire operatives, viz., 29,588 grains of carbon and 1,323 grains of nitrogen in class 3 weekly. In the seven gaols before quoted, viz., Peterborough, &c., this was almost the uniform result. They use a test which they say is very imperfect, and which yet, despite of its fallacies, shows a general concurrence in its favour, but fails, they think, when it does not show that the average gain or loss of weight of body exactly corresponds with the defect or excess of carbon or nitrogen the food contains. As if this were not sufficient, they multiply the supposed loss or gain per week by the number of weeks of imprisonment, and this again by the number of prisoners under inquiry, and then, as at Liverpool, find that in sentences of twelve months the total gain ought to have been 1,645 lbs., whilst in fact it was 85 lbs. in one series, and 25 lbs. in another. Is it not past belief that medical men, occupying a position in which they are employed by the State, should assume it to be possible that if a man ate 1 lb. of food in excess daily, he would increase in weight by that amount, and that this weight should increase at the same rate daily for whatever time the excess of food is taken—that they should use such an argument for any purpose whatever? But as I have never made the statement which they have assigned to me, it is of little importance what arguments they use to show its fallacy; yet I may add, that such misrepresentations should not occur in State documents and scientific discussions.

It now only remains for me to state the alterations which have been made in the dietaries, and the effect of them over the total nutriment supplied.

It has been already mentioned that the general scheme is that which has been in use since 1843, viz., five classes, each referring to a different duration of imprisonment, and having a much smaller amount of food in the lower than in the higher classes. The duration of imprisonment is increased in all the classes, with hard labour, except the first; the effect of which is to prolong the low diet of the 2nd class to four weeks instead of to three weeks, and the medium diet of class 3 to three months, instead of to six weeks. Labour is not any longer regarded as equivalent to a further duration of imprisonment, but the whole dietaries are constructed on the basis of no labour, and certain additions are made for hard labour. There are also three additional kinds of food imported, viz., Indian meal pudding, or, as I judge from the quantity of fluid to be added to it, "stirabout," suet pudding, and cheese; the first in the 1st and 2nd classes only, the second in the 3rd, 4th, and 5th classes only, and the third for the Sunday's dinner only in the four higher classes. The general arrangement of the meals remain unaltered, except that universally the Sunday's dinner is rendered peculiarly uninviting by being composed of bread and cheese only—a circumstance which is likely to make the prisoners have a dread, wholesome or otherwise, of the recurrence of that day.

As to the quantity of food supplied in the five dietaries, the Committee (on p. 72) state, that if they had retained the former plan of placing the prisoner upon the diet of his class, they would simply have had "to slightly increase the dietary proper to the shorter sentences, to somewhat reduce those proper to the longer terms," but as they have determined to make the dietaries progressive, "a somewhat larger addition will have to be made to the diets assigned to the shorter terms." Hence they intended clearly to increase the nutriment in the lowest diet, and from the remarks on page 27 it may be inferred that they intended to diminish that of the highest diet. We will now examine the result in each class in order—

	Carbon. Grains.	Nitrogen. Grains.
CLASS 1, contained 7 lbs. of bread, 2 oz. of oatmeal, and $5\frac{1}{4}$oz. of sugar or molasses weekly, containing	19,860	889
Now there is 8 lbs. of bread, $7\frac{1}{2}$ oz. of maize, $1\frac{1}{2}$ lb. of potatoes, and 12 oz. of skimmed milk, containing......	18,834	838

So that the substitution which they have made has resulted in lowering this lowest class to the extent of 1,000 grains of carbon and 50 grains of nitrogen, instead of making, as they said, "a somewhat larger addition." This *reductio ad absurdam* is doubtless owing to the fact of disregarding the fluid food, and comparing the dietaries upon the solid food, whilst the gruel contained nutriment, which as bread was equal to $46\frac{1}{2}$ oz., or nearly 3 lbs. weekly. Thus the weight of solid food in ounces in their dietaries assumes a progression as follows, without labour:—

	CLASS 1.	CLASS 2.	CLASS 3.	CLASS 4.	CLASS 5.
New scheme ...	170	190	230	267	306
Old scheme ...	112	168	210	212	282

Whilst in the old scheme it was with and without labour. This table shows their intention to increase the low diets.

It is also to be observed that whilst the commitments under this class are usually with hard labour (and wherever the crank or the treadmill exists that will be the labour supplied—the hardest labour known), no provision for food is made for such an one over that of the prisoner confined without labour, whilst doubtless the waste of system is in the one case double that of the other. The importance of this may be properly estimated when I quote from the returns of farm labourers, obtained by the Government, which show that the average quantity per adult, male and female, and including in that term all children above ten years of age, in the worst fed county of England, is more than 33,000 grains of carbon and 1,190 grains of nitrogen weekly.

The committee have felt these low dietaries to be a weak part of their scheme, for on page 72 they take much pains to excuse their conclusions. They say "it is true that these diets of the shorter sentences do not satisfy the requirements of theories based on experiments made upon persons very differently circumstanced, and that they are open to adverse comment from those who, not satisfied with the absence of disease and the preservation of health, insist also that the prisoner shall suffer no loss of weight. But the facts placed at our disposal have satisfied us that scientific data have but a limited and uncertain practical application, and that gain or loss of weight is not to be trusted as an indication of health or as a test of the sufficiency of our dietaries." It will be observed in this passage, that whilst they reject scientific data, which (as they could not use them to determine the effect of confinement or labour or any other agent committed to them for inquiry) it is likely that they should do, they did not use the knowledge upon which scientific data would be based—that of the dietary of free labourers or of paupers in workhouses—as they were directed to do, but which they said they could not ascertain. They place they whole argument upon *an assertion* which, as they were not familiar with county gaols, they could not base upon their own knowledge, viz.: that health was maintained under these circumstances; and they throw aside the evidence of loss of weight (which their own statements had shown to almost universally occur to a considerable extent), that is, they do not use the means of proof open to the scientific man on the one hand, and to the non-scientific man on the other—neither science

nor experience—but act on an assertion which they could not make on their own knowledge. It is repugnant to common sense, and if it yet be true, should have been proved on the best known method, that adults in prison working the crank or the tread-wheel and losing weight almost universally (indeed at Wakefield it was found that during this first week of work at the tread-wheel and with this dietary the loss was seven pounds per man), should keep in health and strength upon a dietary but little more than half that of the worst-fed farm labourers, their wives, and children over ten years of age. Such a result cannot be allowed to rest upon mere assertion or common observation.

	Carbon Grains.	Nitrogen Grains.
Class 2—contained $10\frac{1}{2}$ lbs. of bread, 28 oz. of oatmeal, and $5\frac{1}{4}$ oz. of sugar or molasses, and furnished weekly	26,748	1,211
The Committee have reduced the bread by $2\frac{1}{2}$ lbs. and the oatmeal by 14 oz. They have omitted the sugar altogether, and in their place have supplied 16 ounces of skim milk, 1 oz. of cheese, 36 oz. of potatoes, and 10 oz. of maize, and have reduced the nutriment to	22,468	1,031
thus causing a loss of 4,300 grains of carbon and 180 of nitrogen weekly.		
For hard labour the old system provided only 1 pint of soup per week, in addition to the dietary without labour, which was manifestly adding insult to injury; but this Committee have made the insult greater by omitting the soup and giving 1 oz. of cheese for the Sunday's dinner. But as they had taken away from the former scheme 1 pint of gruel daily, they now restore it with hard labour, and then the nutriment becomes	25,813	1,121
thus lessening the diminution to about 1,000 grains of carbon and 100 grains of nitrogen weekly. This dietary is, however, on the average, not more than three-quarters of that of the worst fed agricultural labourer.		

So much for the low dietaries. Let us now show the effect of the changes upon the highest dietaries.

	Carbon Grains.	Nitrogen Grains.
Class 5—contained 9 lbs. 10 oz. of bread, 16 oz. of separated cooked meat, 22 oz. of oatmeal, about 4 oz. of sugar, 3 pints of soup containing meat and dry and fresh vegetables, 7 lbs. of potatoes, and 3 pints of cocoa, containing $5\frac{1}{4}$ oz. of sugar, and offered in nutriment weekly ...	36,603	1,610
The new dietaries contain 1 lb. more bread, 6 oz. more oatmeal, 3 oz. of cheese, $14\frac{3}{4}$ oz. of flour, $3\frac{3}{4}$ oz. of suet, the same quantity of soup (containing meat and bone, fresh and dried vegetables), and if I read the table right, 2 oz. of molasses, which afford	36,776	1,649
or an increase of 370 grains of carbon and 40 grains of nitrogen weekly.		
With hard labour, which after six months—the period to which this class belongs—is never tread-wheel or crank labour, and does not differ from that of an ordinary trade; 4 oz. of cooked meat, equal to 6 oz. of uncooked meat, is given twice a-week in lieu of 12 oz. of suet pudding, and 1 oz. of cheese is given extra on Sundays, and 2 oz. of peas in place of 1 oz. of barley in the soup thrice a-week. This variation adds only 800 grains of carbon and 140 grains of nitrogen per week—supplying (with 2 oz. of molasses)	37,500	1,790
Class 4 of the old dietaries supplied	33,782	1,566
The new differ from class 5 in supplying 2 oz. of bread less, 1 oz. of cheese less, and 1 lb. of potatoes less, and only 1 oz. of molasses weekly, and contains	35,996	1,605
The same substitution for hard labour is made as in class 5, and the diet contains	36,257	1,733

Thus the higher classes are made higher than in the old dietaries, and the extra allowance for hard labour is only 700 grains of carbon in class 5, whilst in class 4 there is an addition only of 260 grains of carbon supplied, with hard labour.

Of the intermediate class—that corresponding very closely with the diet which I thought to be necessary for the Lancashire operatives, and that of the actual dietary in towns—there is an increase in the new dietaries of 600 grains of carbon and 80 grains of nitrogen, and the addition which the Committee make for hard labour is only 400 grains of carbon weekly.

Thus the Committee neglecting, nay, avowedly discarding scientific data, and guided by their ever-failing test—*experience*—have, whilst making the low dietaries higher, made them lower, and whilst making the higher dietaries lower, have made them higher; and, under the belief that they had made substantial additions of food for hard labour, have, by withdrawing other valuable food, increased these dietaries to a degree which is purely nominal. A striking illustration this of the value of their guide!

The Present State of the Question.

Such having been the labours of the Committee, what is the present state of the question?—

1. It was desired to know, in order to support health, strength and capacity for labour, whether more food is needed in confinement than in freedom.
2. Also whether the quantity of food must be increased as the confinement endures.
3. Also whether the quantity of the food must be better in confinement, and particularly in prolonged confinement.
4. Also whether the vital powers, and particularly those of digestion and assimilation, are so impaired that a higher quality of food can alone be digested, or a lower quality being given an undue portion passes from the body unused.
5. Also the smallest amount of food required by an average man without labour.
6. Also whether the conditions of confinement can be so far assimilated to those of freedom, and particularly by adding exertion in the open air, that if questions one to four should be answered affirmatively the required excess can be dispensed with.
7. Also what is the effect of the various kinds of hard labour upon the waste and nutrition of the body, and the amount and kind of food which will exactly meet that waste.
8. Also whether meat in any quantity is necessary for any and for various terms of imprisonment.
9. Also whether meat may be wholly or partially supplanted by skimmed milk and cheese, or both.
10. Also whether fats may be wholly or partially supplanted by starchy food, for any and for every term of imprisonment.

It is to be observed that there is no class, nor any considerable portion of any class, of operatives in

this country which does not obtain meat in some form, and separated fats. Even in the worst-fed counties, the average consumption by farm labourers and their families was $5\frac{1}{4}$ ounces of meat or bacon, or both, and nearly three ounces of separated fats per adult male and female and child were obtained weekly.

11. Also the digestibility of various foods in confinement.

Sir George Grey's Committee have left all these questions precisely as they found them, and the information is still desired.

12. We had a scheme of dietary supplying at one end scarcely half the food of the lowest-fed class of free labourers, and at the other the food of the well-fed operatives in towns, without proof having been obtained that the former could be borne without injury to health, and that the latter was necessary. —It is so now.
13. Also that five scales of dietary were necessary without having proved that confinement demands increasing food.—It is so now.
14. Also an addition was made to the dietary for those condemned to hard labour, whilst they might be employed in occupations the most diverse in their effect upon the waste of the body—the same addition being given for all the varieties of hard labour.—It is so now.
15. Also aditional food for hard labour was not made in the lowest classes of dietary with deficient food, and when in almost all prisons it is of the most severe kind; but in the higher classes with probably abundant food, and when the labour is scarcely ever of the severe kind.

All these remain precisely as before.

16. Also the addition for hard labour was, so far as it went, substantial, but now it is only in substitution of other foods.
17. Also the low dietaries were affirmed to be too low to sustain health and strength.—They are now made lower.
18. Also the higher dietaries supplied meat daily. The new ones give it with hard labour (which is the usual sentence) five times a week. They were also affirmed to be higher than that of free labourers and of workhouse dietaries. They are now as high or even higher.
19. Also the prisoner was at once put upon the dietary of his class, so that if he were condemned to any period beyond three weeks' imprisonment he obtained the fair average dietary of the operatives in towns, and in most cases would retain his weight and strength, and it was only for comparatively short periods that the insufficient food was given, after which he would get the advantages of freedom. *Now*, all prisoners must be very insufficiently fed for one week, and insufficiently fed for four weeks, during which they will generally lose in weight and strength—a loss which is to be made up with the better dietary at a later period. As the low diets are certainly much lower than the diets of the worst fed men in freedom, it is probable that the effect of this change will be disastrous. Had the low diets been only barely sufficient to maintain weight and strength, the system of progressive dietaries might have been added, but it would not then follow that the prisoners would need the higher dietaries.

As a concluding remark it must be noted that the Committee have taken great care to shield themselves from blame in the event of their recommendations proving to be injurious to the health of the prisoners.

I have mentioned the proviso appended in reference to labour, viz., that if the dietary which they recommend should be found insufficient to maintain health and strength, the labour is to be brought down to the dietary! In their conclusions (page 76) they add further, "that prisoners sentenced to hard labour should not be required to work at times, or under circumstances which would be deemed injurious to the health of free labourers, and that they shall not be required to do any work which in duration and severity would necessitate in any working man an abundant and highly nutritious diet." That is, they provide a dietary for hard labour, but as it may not be a right one, there is to be no hard labour at all in the sense in which it is generally understood, viz., a day's work at the tread-wheel or the crank!

As to the directions in reference to progressive dietaries, they append the remarkable proviso:—"Also that it shall be the duty of the medical officer to see every prisoner on admission, and certify his fitness or otherwise to be placed upon the several dietaries in succession, and that if the prisoner be found unfit, it shall be incumbent upon the medical officer to indicate the dietary upon which he shall be first placed."

Thus of their *proprio motu*, without the experiments which Sir George Grey informed them were requisite, and on their own affirmation, that "it is not a question of health but of discipline," they decree that the dietaries shall be progressive, and frame the whole scheme upon that decision—making, as they say, on that ground more abundant addition to the low diets, and then throw the whole responsibility of this act, as also that of the injurious results of their dietary with labour, upon the medical officer of the prison, and leave him at his peril to do as they had recommended!

Is it simplicity which is here and throughout the report so strikingly exhibited by the Committee?

Hence I venture to affirm that the late inquiry has left the whole question practically as it found it, and has afforded still stronger grounds for the issuance of a Commission of men competent to undertake such a duty as recommended by the Committee of the House of Lords.

There are still the same grounds as before to believe that the low dietaries are too low and the high dietaries unnecessarily high, to maintain health and strength; that only one scale of dietary is necessary for the maintenance of health and strength in confinement (varied somewhat in different parts of the kingdom) without hard labour; that a proper addition can be made for each kind of labour; that a certain amount of labour may be economically employed to lessen the necessity for the use of the richer foods by causing the complete digestion of the cheaper foods, and that the whole scheme can be both simplified and placed on a sound scientific basis.

EXHIBITION OF JET ORNAMENTS.

An attractive exhibition of jet-ornaments was held in St. Hilda's-hall, Whitby, on Tuesday and Wednesday, the 30th and 31st of August, under the auspices of the Whitby Institute. The importance of cultivating refinement and correctness of taste amongst the young workers in jet induced the directors of the Mechanics' Institute to offer prizes for the best designed and most successfully executed ornaments of that material. The first exhibition, held last year, was highly pleasing and encouraging in its results, and showed how much the capabilities of the trade might be developed by the introduction of novel designs and a better educated taste. The jet trade affords permanent and lucrative employment to a very large proportion of the adult and youthful population of Whitby, and the usefulness of an effort to give something of an artistic character to the productions of our local jet-workers is admitted on all hands. Mr. Thompson, M.P., has from the first taken a lively interest in the success of the movement; and the Marquis and Marchioness of Normanby also kindly lent

not only their patronage but their cheerful assistance. The Society of Arts places £10, as a prize, at the disposal of the Institute to be competed for. The exhibition of this year was in every respect more brilliant, as well as more successful, than its predecessor. The hall was thronged by gay and fashionable groups of spectators; pictures and works of art decorated the walls; and some of the principal jet-manufacturers displayed the choicest of their goods. The competitors for the prizes were more numerous than at the previous exhibition; and the beneficial influence of the competition showed itself in enhanced beauty both of design and execution. The judges were the Marchioness of Normanby and Mrs. T. Bagnall in Class 3; and in the other classes Capt. Percival and Messrs. T. Turnbull, sen., and W. Stonehouse undertook the duty. The following were their awards:—

Class 1.—Prize of £10 offered by the Society of Arts, for the best set, comprising brooch, bracelet, and ear-drops of uniform pattern, John Speedy.

Class 2.—For the best brooch of any value, £3. 1st prize, John Speedy; 2nd, John Thornton, £2; 3rd, T. Kingston, £1. For the best bracelet of any value, £3. 1st prize, W. Lunn; 2nd, T. Kingston, £2; 3rd, Garbutt and Warnock, £1; For the best pair of ear-drops, £1. 1st prize, J. Short; 2nd, Jasper Bingant, 10s.

Class 3—(Mr. Thompson's prizes).—For the best brooch of the retail value of from 10s. to 20s., £3, John Raw; for the best bracelet of the same value, £2, J. Thornton.

Class 4.—For the best brooch produced by any youth under 18 years of age, £1 10s. 1st prize, I. Greenbury; 2nd and 3rd, no competition. For the best bracelet, under the same limitation, £1 10s. 1st prize, John Sherwood; 2nd, Alexander Speedy, £1; 3rd, no competition.

Class 5.—Best miscellaneous article not eligible for competition in any other class, £3, John Speedy.

Class 6.—Special novelty prize, exhibiting any new application of jet likely to benefit the trade, £3.—The judges decided that the articles in this class did not comply with the condition.

Class 7.—Bust of the Prince Consort, prize of £4, Mr. Abraham Varley.

Of the successful competitors, Mr. John Speedy, Mr. J. Short, and Mr. Jasper Bingant are in the employment of Mr. Charles Bryan. Mr. Thornton, Mr. Lunn, and Mr. Raw are in the employment of Mr. J. D. Maule. Mr. Kingston is in the employment of Mr. Huntrods, and Mr. Sherwood is with Mr. M. G. Greenbury. Mr. Thompson, in the course of his remarks at the presentation of the prizes, suggested that the prize-articles should be purchased by the Institute, and kept as a yearly record of progressive improvement in taste and workmanship, Mr. Thompson offering to defray the cost of purchasing the prizes.

On Wednesday evening the prizes were awarded to the successful candidates in St. Hilda's-hall, the Marquis of Normanby in the chair, supported by the following gentlemen:—H. S. Thompson, Esq., M.P., C. Richardson, Esq., Field-house; C. Richardson, Esq., St. Hilda's; J. Richardson, Esq., Sneaton; Capt. Percival, T. Bagnall, Esq., G. A. Peters, Esq., Dr. Wilson, Dr. Dowson, Dr. Taylerson, and Dr. Sherwood, the Rev. John Owen, R. E. Pannett, Esq., the Rev. W. Keane, M.A., and the secretaries, Messrs. J. Corner, Ruswarp; and R. T. Gaskin.

The Marquis of Normanby, Mr. H. S. Thompson, the Rev. W. Keane and others addressed the meeting.

Pecuniarily the result of the exhibition is quite satisfactory, the donations having amounted to about £20, and £32 was taken at the door.

Fine Arts.

THE POURTALES COLLECTION.—This famous collection, one of the richest in Europe in antiquities and pictures, will be brought to the hammer early next year. The catalogue, which will run to 2,500 or 3,000 numbers, is expected to be ready in December. The sale is entrusted to two of the principal art auctioneers of Paris, aided by four experts, all well known to amateurs of paintings and objects of *virtu*, and will form one of the most important events in the world of art next spring. The exact date is not yet fixed.

AMSTERDAM EXHIBITION.—A few particulars relative to this bold undertaking, referred to in the last number of the *Journal*, will not be uninteresting. The Crystal Palace in which the exhibition is held, was commenced in 1860; the principal nave is nearly 370 feet long by about 100 feet broad, and connected with this there are four covered courts, each 150 feet long by 33 feet wide. Besides these there is a gallery connected with two smaller rooms or courts; these together have an area of about 2,000 square yards. The whole is surmounted by a tower on which is placed a magnificent statue, representing the Genius of Civilization holding a torch in one hand and a laurel crown in the other. Judging from a woodcut which has appeared in a journal published in Belgium, and from the reports of eye-witnesses, the Dutch Crystal Palace is at once light, elegant, and imposing.

MR. BICKNELL'S COLLECTION. — The Crystal Palace Company have lately added to their exhibition of pictures the collection of Mr. Henry Bicknell, which has been temporarily placed at their disposal for the benefit of the public. This collection consists of about a hundred works, chiefly sketches; and exhibited with them are ten sketches by Mr. David Roberts, which are retained by the artist as personal property, and which may be looked upon as model illustrations of his style. These pictures are shown together, in a room apart from the 1,700 pictures which make up the ordinary contents of the picture-gallery.

Manufactures.

IRON MANUFACTURES IN NEW SOUTH WALES.—At the Fitzroy Iron Mines the first Australian blast-furnace will ere long be in operation, and merchantable iron from native ore will soon be in the market. It appears that there are no grounds for supposing that the quantity of iron is limited, and there is a superabundance of fuel for smelting purposes. In addition to the coal which h s already been worked by the company, large fresh depo ts have recently been discovered. Mr. Mackenzie, e Examiner of Southern Coal Fields, has found, abo four miles from the mine, a seam of coal fully thirty-ei feet thick, and, to all appearance, of excellent quali The This seam is disclosed by the gorge of the Nattai Ri is a thicker seam than any yet found in the c ny. The thickest at present worked, we believe, is a the Cardiff Mine, in Lake Macquarie, but this new se n at Fitzroy beats it altogether. The coal is too far om town to be of any value for export, but, as an almost oundless supply of fuel for local manufacturing purpose it may be of very great value hereafter. A seam thir -eight feet thick, after making ample allowances for t waste in taking out partings, and likewise for bands of nferior coal, will yield 30,000 tons an acre. At Illaw ra he has taken up a piece of land for working a pror ising stratum of clay iron ore, which has already been t ced for a considerable distance, and is supposed, with good reason, to underlie the sandstone so familiar to the inhabitants of Sydney, and to be identical with the stratum that reappears to the north of Sydney, at Brisbane Water. Fitzroy was the first place where iron was discovered in quantity in an accessible

place, but there was no need to have gone all that distance to have looked upon it. According to the statement in Mr. Mackenzie's published lecture, it will be found at a depth of about 100 feet at Manly Beach, and, at some greater distance, under our feet at Sydney, as the stratum dips inland. Which precise locality will be the most profitable to begin working at must be left to practical men to decide, but it is clear that there is an indefinite scope for the manufacture of iron, and when it is once begun, with results profitable enough to provoke imitation, there will be no lack of material to work upon.

Brown Dye for Wool.—M. Wiederhold has devised a new method of obtaining a brown dye for wool. Peroxide of manganese in fine powder is mixed with dry nitrate of soda, and heated to bright redness in a wood furnace. The brownish product obtained is dissolved in water and forms a green solution containing acid manganate of soda (chameleon mineral), which gradually becomes red. When wool is steeped in this red liquor the permanganate of soda becomes decomposed, peroxide of manganese being dissolved in the pores of the fibrous tissue. The colour obtained is stated to stand well against the effects of air and light.

Gun Cotton.—Messrs. Pelouze and Maurey, in a memoir presented at the last meeting of the Paris Academy of Sciences, states it as their opinion, derived from a long and careful investigation of the subject of gun-cotton, that that explosive compound, if now better known as far its composition, mode of production, and properties are concerned, is still, with regard to its employment in fire-arms, in the same position as it was in 1846. "Nothing, in fact, authorises us to believe that is possible, in the present state of our knowledge, either to prevent its spontaneous combustion or to correct in a practical manner its liability to burst the weapons at present used for gunpowder."

Cultivation of Cotton in France.—Attempts are being made to introduce the growth of cotton in the departments of France bordering the Mediterranean. It is now some years since experiments were commenced in the department of the Gard. The spinners of Mulhouse have reported favourably on the material produced, and it is confidently asserted that cotton may be produced not only experimentally, but for commercial purposes over the whole of the fertile and irriguous lands of the Mediterranean littoral. In 1863, MM. Fournès and Théophile Arnaud devoted seven or eight acres of ground, on the banks of the Gardon, to the purpose, but two or more were not irrigated in time, and another plot was found to be too near the river, so the experiment was confined to less than five acres. The following are the principal points contained in the report on the result:—This land, principally consisting of fertile alluvial soil, was planted in the middle of April, with 150lbs. short Louisiana seed. The land had been prepared with two harrowings and a dressing, and the seed was put in rows ten or twelve grains together, in holes half a yard apart. After the first irrigation, the plants having attained the height of four or five inches, all the weaker shoots were removed, and only one left in each hole. After a second watering, when the plants had grown considerably, each was topped, and still later the long lateral shoots were removed. In the beginning of July the flowers began to appear, when the plantation was watered for the third and last time. From this time nothing was done but removing weeds. The first pods began to open at the end of September, and in October commenced the first cotton harvest in France. The plucking was done by women and children, on dry days, and was not completed till the middle of January. The total cost of cultivation is set down at just over £40, and the produce at 375 kilogrammes, value five francs per kilogramme, yielding a net profit of about £33 on between four and five acres.

Welding by Hydraulic Pressure.—A series of experiments have lately been made in Paris by M. Duportail, engineer, in the workshops of the Western Railway, to ascertain whether iron might be welded by hydraulic pressure instead of by the sledge hammer. The latter, indeed has not a sufficient impetus to reach the very core of the metal, while continuous pressure acts indefinitely to any depth. In the experiments alluded to, M. Duportail caused two iron bars, an inch and a half in diameter, and heated to the welding point, to be placed between the piston and the top of an hydraulic press. The bars were welded together by this means with extraordinary ease, the iron being, as it were, kneaded together, and bulged out at the sides under the pressure. The action of the press was suspended when the part welded was brought down to the thickness of the bars. After cooling the welded part was cut through to examine the inside, which was found perfectly compact. To try it, one of the halves was placed under a forge hammer weighing 1,800 kilogrammes, and it was not until the third stroke that the welding was discovered.

Commerce.

Harvest and Corn Trade.—Messrs. J. and E. Sturge, in their circular for the 1st of this month, state that "the weather during the past month has continued warm and dry, enabling the farmers in all our early districts to finish their harvest under most favourable circumstances; but the yield is much complained of. This, we believe, has not been previously the case after a dry season during the last half-century, if ever before, and it is generally attributed to frosts while the wheat was in blossom. We had a decline in price of 1s. to 2s. per quarter early in the month, which has been nearly recovered since. How far the failure of the turnip and other root crops will affect the value of wheat remains to be seen, but the large arrivals, and consequent moderate price of Indian corn, will cause that article to be largely used for feeding. The imports of wheat and flour from America, and arrivals from the Black Sea, have again been heavy, making the total importation during the month of June 511,254 qrs., against 369,346 for May, 1864, and 553,481 for June, 1863. The number of ships on passage from ports to the east of Gibraltar, notwithstanding the large arrivals, is now nearly 600, being an increase of 100 in the month. Prices of wheat in France are declining; this would show that the crop has proved better than was expected, unless, as some think, it is to be attributed to the shortness of water keeping many millers out of the market. A little further reduction would leave a margin for shipments to England. The accounts from the countries bordering on the Baltic, for some time past, describe the weather as wet, cold, and boisterous, and that the crops, although large, are much injured by the rains. Egypt continues to import, and it is expected that Portugal will soon do the same."

Colonies.

Gold.—The quantity of gold-dust imported into the Sydney branch of the Royal Mint from the 1st of January to the 17th of June, 1863, for the purpose of coinage, amounted to 255,081 ounces, and the coin issued consisted of 457,000 sovereigns, and 480,000 half-sovereigns. Total value, £697,000. For the same period of the present year the receipts of gold-dust have reached 368,379 ounces, and the coin issued has amounted to 1,317,000 sovereigns. This large increase in the quantity of gold received is entirely owing to the large quantities that have been received from Melbourne and New Zealand during the last two months. The following table will show the total amount of gold dust received, and coin issued, weekly, from the 31st of March to the 17th of June, 1863 and 1864:—

1863.	Sovs.	Half-sovs.	oz.
January 1 to March 31......	457,000	—	148,617
April 8......	—	—	5,888
" 15......	—	50,000	5,674
" 22......	—	50,000	10,026
" 29......	—	25,000	9,046
May 6......	—	50,000	6,252
" 13......	—	45,000	9,461
" 20......	—	40,000	9,319
" 27......	—	55,000	7,685
June 3......	—	60,000	6,096
" 10......	—	60,000	8,654
" 17......	—	45,000	8,363
	457,000	480,000	235,081
1864.			
January 1 to March 31......	551,000	—	161,642
April 8......	20,000	—	9,912
" 15......	90,000	—	16,489
" 22......	48,000	—	22,208
" 29......	38,000	—	15,121
May 6......	100,000	—	10,142
" 13......	60,000	—	34,427
" 20......	32,000	—	9,763
" 27......	80,000	—	45,198
June 4......	68,000	—	21,362
" 11......	110,000	—	16,308
" 18......	120,000	—	5,807
	1,317,000	—	368,379

The quantity of gold-dust delivered by the escorts from our several gold-fields during the month of May amounted to 27,058 ozs. For the corresponding month of the year 1863 the receipts reached 34,414 ozs. The decrease in the month is, therefore, 7,356 ozs., or 21½ per cent. During the first five months of the present year the quantity of gold received by the escorts amounted to 131,070 ozs. For the same period of the year 1863 the amount was 192,641 ozs. The decrease on the five months is therefore 61,571 ozs., or about 32 per cent. The diminution in the yield of our gold-fields is still attributable to the small quantities that are now received from Forbes, Burrangong, and Braidwood, as compared with last year. The quantity of gold having decreased so considerably, the Government have made the escorts fortnightly instead of weekly. From some of what were formerly considered minor gold-fields the returns show an improvement, and this is particularly the case with Orange and Stony Creek. The following table will show the quantities of gold-dust received monthly by the Western, Southern, and Northern escorts during the first five months of the years 1863 and 1864:—

1863.	Western.	Southern.	Northern.
	oz.	oz.	oz.
January	29,942	21,531	4,455
February.........	18,371	14,902	2,479
March	12,914	12,075	2,491
April	22,591	12,812	3,664
May	17,608	14,152	2,654
	101,426	75,472	15,743
1864.			
January	11,471	10,764	2,380
February.........	13,243	10,377	1,248
March	16,202	13,943	3,158
April	11,736	10,363	2,127
May	14,659	9,803	2,596
	64,311	55,250	11,509

It will be seen from this table that the decrease from the Western gold-fields is 27,115 oz., or 36½ per cent.; from the Southern, 20,222 oz., or 27 per cent.; and from the Northern, 4,234 oz., or 27 per cent.

Publications Issued.

ETUDES SUR L'HISTOIRE DE L'ART—ANTIQUITE—MOYEN AGE—TEMPS MODERNE.—Studies relative to the History of Art. Four vols. 18mo. (*Michel.*) M. Vitet, one of the elder lights of the French Academy, and whose dissertations on Art have made his name known throughout Europe, has just published four small volumes of very valuable materials for the use of whoever may dare to grapple with that gigantic subject—the history of art. M. Vitet recognises the great labour of Winckelmann, and accords him the honour of the bold idea of a History of Art, but he points out the evident incompleteness of the work, as well as the errors which later investigations in the same field have brought to light, and he arrives at the conclusion that a complete History of Art is a labour which none but a literary Hercules should venture to undertake. This being the case, the world must be satisfied with what M. Vitet offers, namely, a collection of essays, most, if not all of which have been published before in the *Revue des Deux Mondes* and elsewhere, but which well deserve to be presented, as they now are, in a collected form. The following are some of the best-known and most important items of the contents:—Pindar and Greek Art—The Eleusinian Marbles—Athens in the fifteenth, sixteenth, and seventeenth centuries—The Campana Collection, specially interesting since its dispersion and the exhibition of a great portion of it in the Louvre—The Roman Christian Mosaics. The Middle Ages are elaborately treated from documents and traditions of "Notre Dame de Noyon," and in papers on "The Architecture of England," "The Historic Monuments of the North-west of France," and other special subjects. Modern Art is examined in essays on painting in Italy, France, and the Low Countries; religious music, dramatic music, a celebrated study of the works of Eustache Lesueur, and another equally well known, entitled "Raphael at Florence." The collection includes critical notices of the productions of recently deceased masters, as Delaroche, Ary Scheffer, Delacriox, down to Flandrin. One of the most interesting portions of the collection is that which treats of the famous fresco of Saint Onorio, to which M. Vitet devotes nearly a hundred pages. This work was discovered about twenty years since, veiled beneath the smoke and dirt of a Florentine atelier, and has called forth much critical discussion. M. Vitet adopts the conclusion of M. Jesi, who, in the height of his enthuisasm, declared they might put him to the rack without making him deny that the work was Raphael's. He would not permit the great painter himself, could he revisit this world, to say it was not his. "You may have your reason," he would say to him, "for disowning it, but that fresco is certainly yours." M. Vitet has his peculiarities—what man of mark has not? and one of them is a rather contemptuous disregard for the works of the esthetical school, and this is not unlikely to be the cause, or at least one of the causes, why the young essayist has perferred to give the world the result of his labours in a collection of brilliant and valuable fragments, rather than in the form of a complete and harmonious history. Had such a critic and essayist as M. Vitet been of an esthetical turn of mind, he could scarcely have avoided writing a history of some, if not all, of the great eras of art.

Notes.

RAILWAY BRAKES.—Considerable attention has been given on the Continent, of late, to the means of stopping

railway trains. A series of experiments was made the other day on the Sambre-et-Meuse Railway, with a new brake, invented by M. Micas. The movement is transmitted with great rapidity by a single brakesman, and by means of a simple lever, without any screw; its mode of action is the pressure of a wooden shoe against the wheels, in such a manner that the latter are raised from contact with the rail to a distance of not more than the twelfth of an inch. The experiments were conducted under the eye of M. Gobert, the Government railway engineer, and in the presence of several engineers of other lines. The results are given as follows:—A train, without an engine, and weighing 195 tons, was started on an incline of 1 in 140—at a speed of seven miles an hour; the train was brought to a stand-still by two brakes, at 230 yards; at the rate of ten miles and a half per hour, at 282 yards; and at twenty-one miles an hour, at 325 yards. The two brakes were coupled and worked by one man. The next trials were made also with two brakes, but disconnected, and worked by two men. At eighteen and a half miles per hour the train was arrested at 190 yards. The next experiments were made on a level portion of the line, with a train driven by a powerful engine at the rate of thirty-three miles per hour; a single brake brought it to a stand-still at 433 yards, and two brakes at 190 yards.

Safety Apparatus in Foul Air.—M. Galibert, of Paris, has invented two apparatuses to enable persons to enter, without danger of suffocation, places where choke-damp or foul air may exist; and their simplicity and ingenuity demand for the inventor a hearing. One of these arrangements is intended for use at short distances only from the outer air. It consists of a mouthpiece of horn, ivory, or wood, pierced in two places for two india-rubber tubes, of the length required by the circumstances, fitted to the mouthpieces above mentioned, and provided within with spirals of metallic wire, to prevent collapse, and of a small instrument to nip the nose, and prevent respiration through that organ. The mouthpiece is provided with a projection which is held between the teeth; the lips close around and exclude the surrounding air, and the operator draws fresh air through one tube while he exhales that used by the lungs through the other. The tongue performs the part of a valve covering the two holes in the mouthpiece alternately, and it is said that after a few seconds the action becomes perfectly easy, and as it were natural. Where the distance is at all considerable, and, consequently, the drag of the tubes considerable, the mouthpiece may be held in place by means of a band; and, in the case of the presence of gases irritating to the eyes, a hood with glass in front is to be added. The other apparatus is for use in places further removed from the open air. In this the tubes are replaced by an air-bag carried by the operator. The same mouth and nose pieces are used, and short tubes communicate with the bag, which is fixed on the back by means of braces or straps; the latter is made in the form of a Spanish wine-skin, and contains when inflated about seventeen gallons of air; one end of the aspiration tube is connected with the lower part of the air-bag, and that of the respiration tube with the upper end of the bag, so that while the warm air from the lungs occupies the upper portion of the bag, the diver, as he may be called, draws fresh air from the bottom. The inventor says that such a bag will suffice for a man's respiration for half-an-hour, the same air passing without danger several times through the lungs. In cases where the duty to be performed occupies a longer time, the operator is provided with extra bags, to take the place of those which are exhausted, or with a second apparatus; and in certain cases these may be drawn out and replaced by others from without. The apparatus is also mentioned as available in cases where medical men recommend total immersion, as a patient could with it breathe freely from the bottom of a bath. M. Galibert's invention has been extensively approved and adopted; it has been reported upon by the Société d'Encouragement of Paris, and by the engineer-in-chief of the School of Mines; and it is in use in the municipal service of Paris, in the Spanish mines of the Credit Mobilier, the mines of Douchy, by the Parisian Gas Company, and many other establishments. The other day M. Galibert, armed with his apparatus, descended into a cellar filled with the fumes of burnt resinous substances, at the barracks of the Pompeurs, in the Rue du Chateau d'Eau, in the presence of General Uhrich and all the officers of the corps, and remained there a considerable time without exhibiting the slightest symptoms of suffering.

Hotel Dieu.—It will be remembered, that a week or two since the Emperor issued a decree, in the form of a letter from Vichy, addressed to Marshal Vaillant, the Minister of the Imperial Household and of Fine Arts, to the effect that the rebuilding of the famous hospital, *l'Hôtel Dieu*, should be commenced as soon as possible, and that the works of the new opera should be delayed in order that the two new edifices should be completed and crowned at the same time. "I feel it very important, in a moral point of view," says Louis Napoleon, "that the monument dedicated to pleasure should not be raised before the asylum of suffering." This Imperial order has of course been put in train for execution without loss of time. The Hôtel Dieu of Paris is certainly one of the most celebrated establishments of the kind in the world, and in the pre-philanthropic age, before the time of the Howards and Frys, it was looked upon as a model, and deservedly so. At present its relative position is changed, and for many years it has been in a terrible condition, its position rendering much improvement impossible. The draft-plans for the new building are prepared. It will be built on the island on which the old one stands, but on the other side of it, and will in fact occupy nearly the whole of the space between the Quai Napoleon and the Place du Parois Notre Dame on the one hand, and between the Rue de la Cité and the Rue d'Arcole on the other. The new hospital will form a quadrangle, covering about 2,200 square mètres, or about twice the space occupied by the old one and its dependencies.

Patents.

From Commissioners of Patents Journal, September 2nd.

Grants of Provisional Protection.

Aniline, producing colour from—1949—A. H. A. Pflughaupt.
Arches, floors, &c., blocks for the construction of—2005—H. Pether.
Bricks, ornamental—1009—F. Potts and C. Harvey.
Chronographe, electro-balistic—1840—P. Æ. Le Boulengé.
Croquet, articles used in the game of—1894—H. McEvoy.
Dyeing and printing—1409—E. J. Hughes.
Dyeing and printing, colouring matter for—1867—A. Dalzell.
Hammocks, method of slinging—1644—E. T. St. Lawrence McGwire.
Horsehair, preparation of sorgho plants as a substitute for—2039—C. F. Darcagne.
Languages, apparatus to facilitate the acquisition of—1944—A. Long.
Mashing apparatus, self-acting—1177—J. Roy.
Ordnance and gun carriages—1372—R. A. Brooman.
Paper, presses for stamping or embossing—2017—W. Jones.
Ships, construction of—1033—T. H. Holderness and H. Jordan.
Submarine works, construction of—2041—B. B. Stoney.
Tapes, webbings, bands, ribbons, &c.—1942—J. and M. Radcliffe.
Vegetable fibres, treatment of—1031—B. F. Brunel.
Vessels for naval and merchant service—1450—A. Walker.
Wringing and mangling—1675—J. B. Howell.

Inventions with Complete Specifications Filed.

Boots and shoes, manufacture of—2113—G. Haseltine.
Floor cloth—2084—A. Ford.

From Commissioners of Patents Journal, September 6th.

Patents on which the Stamp Duty of £50 has been Paid.

2163. J. Harris.
2156. R. Shaw.
2206. R. McConnel.
2211. P. Effertz.
2213. F. Bennett.
2203. F. E. Schneider.
2243. R. O. White.
2261. J. Bowns.

Patents on which the Stamp Duty of £100 has been Paid.

2290. T. Bradford.
2299. E. Leigh.
2362. J. Harrison.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, SEPTEMBER 16, 1864. [No. 617. Vol. XII.

TABLE OF CONTENTS.

Announcements by the Council.

EXAMINATIONS, 1865.

The Programme of Examinations for 1865 is now ready, and may be had gratis on application to the Secretary.

Proceedings of the Society.

EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 678.)

LOGIC AND MENTAL SCIENCE.

THREE HOURS ALLOWED.

All the candidates should attempt at least six questions in the first Section. In each of the other Sections they should attempt at least three questions.

LOGIC.

1. Illustrate the universal principle of reasoning as laid down by Aristotle.
2. Show that logic does not profess to furnish a peculiar method of reasoning.
3. What is the advantage of employing, in logic, unmeaning symbols instead of words which have a meaning?
4. Show how common terms are obtained, and how they are merely inadequate notions of individuals.
5. Explain Opposition and Conversion, according to Whateley, and offer any criticisms that occur to you.
6. Ordinate the following terms, first, in extension, and secondly, in comprehension:—

   Greek, European, Being, Animal, Man, Athenian, and explain the relation between Comprehension and Extension.

7. Give a table of judgments according to Thomson and Hamilton.
8. Give a table of the syllogistic figures, showing the places where the major premise, the minor premise, and the middle term stand in each figure.
9. Show why the middle term must be distributed in one of the terms of a syllogism.
10. Show the faults, if any, in the following syllogisms:—

   Some works of art are useful.
   All works of man are works of art.
   Some works of man are useful.

   All men are good.
   A murderer is a man.
   A murderer is good.

   All men are corporeal.
   No angels are men.
   No angels are corporeal.

11. Give some classification of Fallacies.

BISHOP BUTLER'S SERMONS.

1. How may the subject of morals be treated; and how does Butler treat the subject?
2. Give a scheme of the appetites and affections of human nature, and of their relations to each other.
3. Do you observe any inconsistency in the rank which Butler assigns to benevolence in different parts of his discourses?
4. If a man were to eat merely to support life, what would be his principle of action? If he were moved by hunger, what would be his principle of action?
5. Show how we could have no happiness if we had no affection but self-love.
6. Give a short abstract of Butler's eleventh sermon.
7. Give a short abstract of his system.

PALEY'S MORAL PHILOSOPHY.

1. What are the three rules of life according to Paley?
2. How do these rules often mislead us?
3. State one or two arguments for and against the system of moral instincts.
4. In what does an act of duty differ from an act of prudence? Criticise Paley's doctrine.
5. Illustrate the doctrine of general consequences, and show that whatever is expedient is right.
6. What two methods are there of coming at the will of God on any point?
7. How are rights divided?
8. State and refute the doctrine of the social compact.

STEWART'S PHILOSOPHY OF THE HUMAN MIND.

1. Show how the phenomena which the mind exhibits have no necessary connection with our opinions concerning its nature and essence.
2. Give some instances of our tendency to blend well-ascertained truths with principles which rest wholly on conjecture.
3. What natural prejudices seem to have given rise to the common theories of perception?
4. Distinguish between efficient causes and physical causes.

5. What is Stewart's opinion as to our power of attending to more than one thing at one and the same instant?

6. What is meant by the association of ideas? State some of the laws of association.

7. Illustrate the influence of association on our tastes.

8. What are meant by our secondary desires?

9. Explain Stewart's statement that the exercise both of conception and imagination is always accompanied with a belief that their objects exist.

MILLS' LOGIC.

1. Define Induction.

2. State and discuss the fundamental principle or general axiom of Induction.

3. Explain and criticise Mill's employment of the term *unconditionalness.*

4. Describe the kind of Induction which is natural to the mind when unaccustomed to scientific methods. How does Bacon characterise this kind of Induction?

5. Distinguish, after Mill, Proper Induction from Verbal Transformations.

6. State and briefly describe the principal operations which Mill regards as subsidiary to Induction.

7. What is meant by Anticipation, and what by Colligation in inductive inquiry?

8. Distinguish between Observation and Experiment?

9. Distinguish between Induction, Deduction, and Analogy.

LATIN AND ROMAN HISTORY.

THREE HOURS ALLOWED.

SECTION I.

Translate—

Illum ego per flammas et mille sequentia tela
Eripui his humeris, medioque ex hoste recepi;
Ille, meum comitatus iter, maria omnia mecum
Atque omnes pelagique minas coelique ferebat,
Invalidus, virês ultra sortemque senectae;
Quin, ut te supplex peterem et tua limina adirem,
Idem orans mandata dabat. Gnatique patrisque,
Alma, precor, miserere: potes namque omnia, nec te
Nequidquam lucis Hecate praefecit Avernis:
Si potuit Manes arcessere conjugis Orpheus,
Threïcia fretus cithara fidibusque canoris;
Si fratrem Pollux alterna morte redemit,
Itque reditque viam toties. Quid Thesea magnum,
Quid memorem Alciden? Et mî genus ab Jove summo.

1. Parse fully the words, *humeris, iter, pelagi, sortem, adirem, patris, omnia, lucis, citharâ, viam.*

2. Give the perfect tenses indicative and the active supines of the verbs *eripui, ferebat, peterem, potes, arcessere, redemit.*

Explain the allusions to *Orpheus, Pollux, Theseus, Alciden*

SECTION II.

Translate—

Quis procul ille autem ramis insignis olivae,
Sacra ferens? Nosco crines incanaque menta
Regis Romani, primus qui legibus urbem
Fundabit, Curibus parvis et paupere terra
Missus in imperium magnum. Cui deinde subibit,
Otia qui rumpet patriae, residesque movebit
Tullus in arma viros et jam desueta triumphis
Agmina. Quem juxta sequitur jactantior Ancus,
Nunc quoque iam nimium gaudens popularibus auris.
Vis et Tarquinios reges animamque superbam
Ultoris Bruti fascesque videre receptos?
Consulis imperium hic primus saevasque secures
Accipiet, natosque pater nova bella moventes
Ad poenam pulchra pro libertate vocabit.

1. Parse fully the words, *ramis, regis, terrâ, cui, triumphis, auris, natos, bella.*

2. Decline fully, *resides, fasces, secures, libertas.*

3. Give the perfect tenses, indicative, and the supines of the verbs, *nosco, missus, subibit, rumpet, sequitur, vis, videre, accipiet.*

4. Explain the allusions to *Numa, Ancus,* and *Brutus.*

SECTION III.

Translate—

Sed ubi ille adsedit, Catilina, ut erat paratus ad dissimulanda omnia, demisso voltu, voce supplici postulare, "Patres conscripti ne quid de se temere crederent; ea familia ortum, ita se ab adulescentia vitam instituisse, ut omnia bona in spe haberet; ne aestumarent, sibi, patricio homini, quoius ipsius atque majorum plurima beneficia in plebem Romanam essent, perdita re publica opus esse, quom eam servaret M. Tullius, inquilinus civis urbis Romae." ad hoc maledicta alia quom adderet, obstrepere omnes, hostem atque parricidem vocare. tum ille furibundus: "Quoniam quidem circumventus" inquit "aq inimicis praeceps agor, incendium meum ruina extinguam." —*Bell Cat.*, § xxxi.

1. Parse fully the words, *voltu, familiâ, sibi, perditâ, obstrepere, ruinâ.*

2. Give the perfect tenses, indicative, and the supines of the verbs, *crederent, haberet, perditâ, adderet, agor, extinguam.*

3. Turn Catilina's speech into *oratio recta.*

SECTION IV.

Translate—

Post eum diem quidam L. Tarquinius adductus ad senatum erat, quem ad Catilinam proficiscentem ex itinere retractum aiebant; is, quom se diceret indicaturum de conjuratione, si fides publica data esset, jussus a consule quae sciret edicere, eadem fere quae Volturcius, de paratis incendiis, de caede bonorum, de itinere hostium senatum docet; praeterea se missum a M. Crasso, qui Catilinae nuntiaret, ne eum Lentulus et Cethegus aliique ex conjuratione deprehensi terrerent, eoque magis properaret ad urbem accedere, quo et ceterorum animos reficeret et illi facilius e periculo eriperentur. sed ubi Tarquinius Crassum nominavit, hominem nobilem, maxumis divitiis, summa potentia, alii rem incredibilem rati, pars tametsi verum existumabant, tamen quia in tali tempore tanta vis hominis magis leniunda quam exagitanda videbatur, plerique Crasso ex negotiis privatis obnoxii conclamant indicem falsum esse, deque ea re postulant uti referatur. —*Bell Cat.*, § xlviii.

1. Parse fully *proficiscentem, ceterorum, eriperentur, divitiis, Crasso, indicem.*

2. Give the perfect tenses indicative and supines of the verbs *diceret, sciret, edocet, terrerent, rati, referatur.*

3. Decline fully *itinere, fides, rem, vis, hominis.*

SECTION V.

1. What were the powers of the Dictator? By whom was he appointed, and for what purpose? Mention instances.

2. Give an account of the seven consulships of the Fabii? What great men bore this name?

3. What was the purpose of the Terentilian Law? To what did it lead?

4. How did the first Decemvirate differ from the second?

5. What freed Rome from the Œqui and Volsci?

6. Give an account of the great Latin War, and the final settlement of Latium.

SECTION VI.

1. When was personal slavery for debt abolished and by whom?

2. Give an account of the war with Pyrrhus.

3. Write a life of Hannibal. What was the cause of his failure against Rome?

4. Narrate the successive steps by which Rome got complete possession of Greece.

5. What was the character of the Roman Government of the provinces?

6. Write a life of Cicero.

(To be continued.)

Proceedings of Institutions.

THE FAVERSHAM INSTITUTE.—ANNUAL MEETING.—On Wednesday, the 7th of August, the tenth annual meeting of the Faversham Institute was held in the Lecture Hall, Mr. James Higham in the chair. The Managing Director (the Mayor) then read the report, which stated that at the present time there are no less than 1,125 members, showing a net increase during the year of 120, and the Institution is now the largest of its kind in the county of Kent, and nearly the largest in the country. The finances are in a prosperous condition, the debt contracted last year to the treasurer is nearly liquidated. The library is well supported. The classes, with the exception of those for reading and writing, have not been so successful as could be wished. The committee report the success which attended the junior examinations in January, and the Society of Arts examinations in April. At the former twenty-one candidates presented themselves, and were examined in one or more of the following branches:—Arithmetic, English grammar, and composition, English history, reading, and writing. Nine of the candidates obtained prizes, which were publicly distributed in Faversham, by S. G. Johnson, Esq. At the Society of Arts examinations in April, eight candidates underwent the previous, and seven the final examinations. Of these, two obtained third-class, two second-class, and one a first-class certificate. Through the kindness of friends, the committee are in a position to give prizes to the successful candidates. These prizes, together with the certificates, will be publicly distributed on an early occasion. Prizes for answers to the questions in the *Monthly Journal* have been awarded to George Kay, Frederick Austin, T. C. Thornicraft, and to the representatives of the late Frederick Hills. The *Monthly Journal* has been published with considerable regularity during the year, and various other Institutes at Leeds, Newport, and other large towns have followed the example of the Faversham Institute, and are now publishing monthly records of their proceedings. A horticultural society, a musical society, a benefit society, and a cricket club have been established in connection with the Institute, and are successfully at work; and a working men's club has been affiliated to the Institute. The committee have sanctioned the formation of an economic museum, similar to that established at Twickenham, by Mr. Twining, one of the vice-presidents of the Society of Arts. The success of this project will entitle the Institute to a very liberal donation by Mr. Twining, in the shape of museum furniture, whilst it will tend very greatly to increase the usefulness of the Institute. The committee have offered the following prizes, to be competed for by members of the Institute: 1st, a book, the value of a guinea, for the best; 2nd, a book, the value of half a guinea, for the second best, essay on the "advantages to be derived from the study of history;" also a book, of the value of ten shillings, for the best, one of the value of seven shillings and sixpence for the second best, and one of the value of five shillings for the third best specimen of pencil drawing. The essays and drawings are to be forwarded to the Institute in November, and it is hoped that the competitors will be so numerous as to render a second offer of prizes desirable.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—BATH, 1864.

The thirty-fourth meeting of the Association commenced on Wednesday, the 14th instant, under the presidency of Sir Charles Lyell, Bart., LL.D., F.R.S. The General Committee held its first meeting at one o'clock, and the first general meeting of the Association was held in the Theatre, at eight o'clock, in the evening, when Sir W. G. Armstrong, the President for last year, resigned the chair to Sir Charles Lyell, who delivered an address, of which the following is an abstract:—

"The place where we have been invited this year to hold our thirty-fourth meeting is one of no ordinary interest to the cultivators of physical science. What renders Bath a peculiar point of attraction to the student of natural phenomena is its thermal and mineral waters, to the sanatory powers of which the city has owed its origin and celebrity. The great volume and high temperature of these waters render them not only unique in our island, but perhaps without a parallel in the rest of Europe, when we duly take into account their distance from the nearest region of violent earthquakes or of active or extinct volcanos.

. . . .

"One of our former Presidents, Dr. Daubeny, has remarked that nearly all the most celebrated hot springs of Europe, such as those of Aix-la-Chapelle, Baden-Baden, Naples, Auvergne, and the Pyrenees, have not declined in temperature since the days of the Romans, for many of them still retain as great a heat as is tolerable to the human body, and yet when employed by the ancients they do not seem to have required to be first cooled down by artificial means. This uniformity of temperature, maintained in some places for more than 2,000 years, together with the constancy in the volume of the water, which never varies with the seasons, as in ordinary springs, the identity also of the mineral ingredients which, century after century, are held by each spring in solution, are striking facts, and they tempt us irresistibly to speculate on the deep subterraneous sources both of the heat and mineral matter. How long has this uniformity prevailed? Are the springs really ancient in reference to the earth's history, or, like the course of the present rivers and the actual shape of our hills and valleys, are they only of high antiquity when contrasted with the brief space of human annals? May they not be like Vesuvius and Etna, which, although they have been adding to their flanks, in the course of the last 2,000 years many a stream of lava and shower of ashes, were still mountains very much the same as they now are in height and dimensions from the earliest times to which we can trace back their existence? Yet although their foundations are tens of thousands of years old, they were laid at an era when the Mediterranean was already inhabited by the same species of marine shells as those with which it is now peopled; so that these volcanos must be regarded as things of yesterday in the geological calendar.

. . . .

"The hot springs of the Pyrenees, the Alps, and many other regions are situated in lines along which the rocks have been rent, and usually where they have been displaced or "faulted." Similar dislocations in the solid crust of the earth are generally supposed to have determined the spots where active and extinct volcanos have burst forth; for several of these often affect a linear arrangement, their position seeming to have been determined by great lines of fissure. Another connecting link between the volcano and the hot spring is recognizable in the great abundance of hot springs in regions where volcanic eruptions still occur from time to time. It is also in the same districts that the waters occasionally attain the boiling temperature, while some of the associated stufas emit steam considerably above the boiling point. But in proportion as we recede from the great centres of igneous activity, we find the thermal waters decreasing in frequency and in their average heat, while at the same time they are most conspicuous in those territories where, as in Central France or the Eifel in Germany, there are cones and craters still so perfect in their form, and streams of lava bearing such a relation to the depth and shape of the existing valleys, as to indicate that the internal fires have become dormant in comparatively recent times. If there be exceptions to this rule, it is where hot springs are met with in parts of the Alps and

Pyrenees which have been violently convulsed by modern earthquakes.

. . . .

"Dr. Daubeny, after devoting a month to the analysis of the Bath waters in 1833, ascertained that the daily evolution of nitrogen gas amounted to no less than 250 cubic feet in volume. This gas, he remarks, is not only characteristic of hot springs, but is largely disengaged from volcanic craters during eruptions.

. . . .

"Carbonic acid is another of the volatilised substances discharged by the Bath waters. Dr. Gustav Bischoff, in the new edition of his valuable work on chemical and physical geology, when speaking of the exhalations of this gas, remarks that they are of universal occurrence, and that they originate at great depths, becoming more abundant the deeper we penetrate. He also observes that when the silicates, which enter so largely into the composition of the oldest rocks, are percolated by this gas, they must be continually decomposed, and the carbonates formed by the new combinations thence arising must often augment the volume of the altered rocks. This increase of bulk, he says, must sometimes give rise to a mechanical force of expansion capable of uplifting the incumbent crust of the earth, and may also act laterally so as to compress, dislocate, and tilt the strata. There are probably many distinct causes of such upward, downward, and lateral movements, and any new suggestion on this head is most welcome; but I believe the expansion and contraction of solid rocks, when they are alternately heated and cooled, and the fusion and subsequent consolidation of mineral masses, will continue to rank, as heretofore, as the most influential causes of such movements.

"The temperature of the Bath waters varies in the different springs from 117° to 120° Fahr. This, as before stated, is exceptionally high, when we duly allow for the great distance of Bath from the nearest region of active or recently extinct volcanos and of violent earthquakes. The hot springs of Aix-la-Chapelle have a much higher temperature, viz., 135° Fahr., but they are situated within forty miles of those cones and lava streams of the Eifel, which, though they may have spent their force ages before the earliest records of history, belong, nevertheless, to the most modern geological period. Bath is about 400 miles distant from the same part of Germany, and 440 from Auvergne—another volcanic region, the latest eruptions of which were geologically coëval with those of the Eifel. When these two regions in France and Germany were the theatres of frequent convulsions, we may well suppose that England was often more rudely shaken than now; and such shocks as that of October last, the sound and rocking motion of which caused so great a sensation as it traversed the southern part of the island, and which seems to have been particularly violent in Herefordshire, may be only a languid reminder to us of a force of which the energy has been gradually dying out. The geological map of the environs of Bath shows numerous lines of fault or displacement of the rocks, and one of these has shifted the strata vertically as much as 200 feet. There are other lines of displacement not yet laid down on the map the existence of which must be inferred from the different levels at which the same formations crop out on the flanks of the hills to the north and south of the city. I have therefore little doubt that the Bath springs, like most other thermal waters, mark the site of some great convulsion and fracture which took place in the crust of the earth at some former period—perhaps not a very remote one, geologically speaking.

"If we adopt the theory that the nitrogen is derived from the deoxidation of atmospheric air carried down by rain-water, we may imagine the supply of this water to be furnished by some mountainous region, perhaps a distant one, and that it descends through rents or porous rocks till it encounters some mass of heated matter by which it is converted into steam, and then driven upwards through a fissure. In its downward passage the water may derive its sulphate of lime, chloride of calcium, and other substances from the decomposition of the gypseous, saline, calcareous, and other constituents of the rocks which it permeates.

. . . .

"Professor Roscoe, of Manchester, has been lately engaged in making a careful analysis of the Bath waters, and has discovered in them three metals which they were not previously known to contain—namely copper, strontium, and lithium; but he has searched in vain for cæsium and rubidium, those new metals, the existence of which has been revealed to us in the course of the last few years by spectrum analysis.

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"It is impossible not to suspect that the wonderful efficacy of some mineral springs, both cold and thermal, in curing diseases, which no artificially prepared waters have as yet been able to rival, may be connected with the presence of one or more of these elementary bodies previously unknown; and some of the newly found ingredients, when procured in larger quantities, may furnish medical science with means of combating diseases which have hitherto baffled all human skill.

"While I was pursuing my inquiries respecting the Bath waters, I learned casually that a hot spring had been discovered at a great depth in a copper mine near Redruth in Cornwall, having about as high a temperature as that of the Bath waters, and of which, strange to say, no account has yet been published. It seems that, in the year 1839, a level was driven from an old shaft so as to intersect a rich copper-mine at the depth of 1,350 feet from the surface. Through the contents of this lode (known as the Wheal Clifford lode) a powerful spring of hot water was observed to rise, which has continued to flow with undiminished strength ever since. The water has been analyzed by Professor William Allen Miller, F.R.S., who finds that the quantity of solid matter is so great as to exceed by more than four times the proportion of that yielded by the Bath waters. Its composition is also in many respects very different, for it contains but little sulphate of lime, and is almost free from the salts of magnesium. It is rich in the chlorides of calcium and sodium, and it contains one of the new metals—cæsium, never before detected in any mineral spring in England, but its peculiar characteristic is the extraordinary abundance of lithium, of which a mere trace had been found by Professor Roscoe in the Bath waters, whereas in this Cornish hot spring this metal constitutes no less than a twenty-sixth part of the whole of the solid contents.

"Hot springs are, for the most part, charged with alkaline and other highly soluble substances, and, as a rule, are barren of the precious metals, gold, silver, and copper, as well as of tin, platinum, lead, and many others, a slight trace of copper in the Bath waters being exceptional. Nevertheless there is a strong presumption that there exists some relationship between the action of thermal waters and the filling of rents with metallic ores. The component elements of these ores may, in the first instance, rise from great depths in a state of sublimation or of solution in intensely heated water, and may then be precipitated on the walls of a fissure as soon as the ascending vapours or fluids begin to part with some of their heat. Almost everything, save the alkaline metals, silica, and certain gases, may thus be left behind long before the spring reaches the earth's surface. If this theory be adopted, it will follow that the metalliferous portion of a fissure, originally thousands of feet or fathoms deep, will never be exposed in regions accessible to the miner until it has been upheaved by a long series of convulsions, and until the higher parts of the same rent, together with its contents and the rocks which it had traversed, have been removed by aqueous denudation. Ages before such changes are accomplished thermal and mineral springs will have ceased to act; so that the want of identity between the mineral ingredients of hot springs and the contents of metalliferous veins, instead of mili-

tating against their intimate relationship, is in favour of both being the complementary results of one and the same natural operation.

"But there are other characters in the structure of the earth's crust more mysterious in their nature than the phenomena of metalliferous veins, on which the study of hot springs has thrown light—I allude to the metamorphism of sedimentary rocks. Strata of various ages, many of them once full of organic remains, have been rendered partially or wholly crystalline. It is admitted on all hands that heat has been instrumental in bringing about this re-arrangement of particles, which, when the metamorphism has been carried out to its fullest extent, obliterates all trace of the imbedded fossils. But as mountain-masses many miles in length and several thousands of feet in height, have undergone such alteration, it has always been difficult to explain in what matter an amount of heat capable of so entirely changing the molecular condition of sedimentary masses could have come into play without utterly annihilating every sign of stratification, as well as of organic structure.

"Various experiments have led to the conclusion that the minerals which enter most largely into the composition of the metamorphic rocks have not been formed by crystallizing from a state of fusion, but that they have been derived from liquid solutions—a process requiring a far less intense degree of heat. Thermal springs, charged with carbonic acid and with hydro-fluoric acid (which last is often present in small quantities), are powerful causes of decomposition and chemical reaction in rocks through which they percolate. If, therefore, large bodies of hot water permeate mountain-masses at great depths, they may in the course of ages superinduce in them a crystalline structure; and in some cases strata in a lower position and of older date may be comparatively unaltered, retaining their fossil remains undefaced, while newer rocks are rendered metamorphic. This may happen where the waters, after passing upwards for thousands of feet, meet with some obstruction, as in the case of the Wheal-Clifford spring, causing the same to be laterally diverted so as to percolate the surrounding rocks. The efficacy of such hydro-thermal action has been admirably illustrated of late years by the experiments and observations of Sénarmont, Daubrée, Delesse, Scheerer, Sorby, Sterry Hunt, and others."

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"The study, of late years, of the constituent parts of granite has led to the conclusion that their consolidation has taken place at temperatures far below those formerly supposed to be indispensable. Gustav Rose has pointed out that the quartz of granite has the specific gravity of 2·6, which characterizes silica when it is precipitated from a liquid solvent, and not that inferior density, namely 2·3, which belongs to it when it cools and solidifies in the dry way from a state of fusion. But some geologists, when made aware of the intervention, on a large scale, of water, in the formation of the component minerals of the granitic and volcanic rocks, appear of late years to have been too much disposed to dispense with intense heat when accounting for the formation of the crystalline and unstratified rocks. As water in a state of solid combination enters largely into the aluminous and some other minerals, and therefore plays no small part in the composition of the earth's crust, it follows that, when rocks are melted, water must be present, independently of the supplies of rain-water and sea-water which find their way into the regions of subterranean heat. But the existence of water under great pressure affords no argument against our attributing an excessively high temperature to the mass with which it is mixed up. Still less does the point to which the melted matter must be cooled down before it consolidates or crystallizes into lava or granite afford any test of the degree of heat which the same matter must have acquired when it was melted and made to form lakes and seas in the interior of the earth's crust.

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"The exact nature of the chemical changes which hydrothermal action may effect in the earth's interior will long remain obscure to us, because the regions where they take place are inaccessible to man; but the manner in which volcanos have shifted their position throughout a vast series of geological epochs—becoming extinct in one region and breaking out in another—may, perhaps, explain the increase of heat as we descend towards the interior, without the necessity of our appealing to an original central heat or the igneous fluidity of the earth's nucleus.

"I hinted, at the beginning of this address, that the hot springs of Bath may be of no high antiquity, geologically speaking,—not that I can establish this opinion by any positive proofs, but I infer it from the mighty changes which this region has undergone since the time when the British seas, rivers, and lakes were inhabited by the existing species of Testacea. Marine straits extended, at a modern period, between what are now the estuaries of the Severn and the Dee, as shown by the discovery of marine shells of recent species in drift covering the water-shed which divided those estuaries. At the time when these shells were living, the Cotswold Hills formed one of the numerous islands of an archipelago into which England, Ireland, and Scotland were then divided. The amount of vertical movement which would be necessary to restore such a state of the surface as prevailed when the position of land and sea were so different would be very great.

"Nowhere in the world, according to our present information, is the evidence of upheaval, as manifested by upraised marine shells, so striking as in Wales. Fossil shells in stratified drift have been found at the top of a hill called Moel Tryfaen, near the Menai Straits, and not far from the base of Snowdon. The whole fauna bears testimony to a climate colder than that now experienced in these latitudes. A considerable part of what is called the glacial epoch had already elapsed before the shelly strata in question were deposited on Moel Tryfaen, as we may infer from the polished and striated surfaces of rocks on which the drift rests, and the occurrence of erratic blocks smoothed and scratched, at the bottom of the same drift."

The President then discussed the supposed causes of the glacial period, and specially mentioned one suggested by a celebrated Swiss geologist, M. Escher von der Linth, who "gave it as his opinion in 1852, that if it were true, as Ritter had suggested, that the great African desert, or Sahara, was submerged within the modern or post-tertiary period, that same submergence might explain why the Alpine glaciers had attained so recently those colossal dimensions which, reasoning on geological data, Venetz and Charpentier had assigned to them. Since Escher first threw out this hint, the fact that the Sahara was really covered by the sea at no distant period has been confirmed by many new proofs. The distinguished Swiss geologist himself has just returned from an exploring expedition through the eastern part of the Algerian desert, in which he was accompanied by M. Desor, of Neuchatel, and Professor Martins, of Montpellier. These three experienced observers satisfied themselves, during the last winter, that the Sahara was under water during the period of the living species of Testacea. Other important changes in these regions had evidently taken place, so great indeed that a map of Africa in the glacial period would no more resemble our present maps of that continent than Europe now resembles North America. If, then, argues Escher, the Sahara was a sea in post-tertiary times, we may understand why the Alpine glaciers formerly attained such gigantic dimensions, and why they have left moraines of such magnitude on the plains of northern Italy and the lower country of Switzerland. The Swiss peasants have a saying, when they talk of the melting of the snow, that the sun could do nothing without the Föhn, a name which they give to the well-known sirocco. This wind, after sweeping over a wide expanse of parched and

burning sand in Africa, blows occasionally for days in succession across the Mediterranean, carrying with it the scorching heat of the Sahara to melt the snows of the Apennines and Alps. . . . . MM. Escher and Denzler have both of them observed, on different occasions, that the thickness of one foot of snow has disappeared in four hours during the prevalence of this wind."

After mentioning other instances showing the great power of this wind, and the important influence of its intermittent action, the President went on to urge that much greater changes would result from its total cessation. But this would give "no idea of what must have happened in the glacial period; for we cannot suppose the action of the south wind to have been suspended; it was not in abeyance, but its character was entirely different, and of an opposite nature, under the altered geographical conditions above contemplated. First, instead after passing over a parched and scorching desert, between the twentieth and thirty-fifth parallels of latitude, it would plentifully absorb moisture from a sea many hundreds of miles wide. Next, in its course over the Mediterranean, it would take up still more aqueous vapour; and when, after complete saturation, it struck the Alps, it would be driven up into the higher and more rarified regions of the atmosphere. There the aerial current, as fast as it was cooled, would discharge its aqueous burden in the form of snow, so that the same wind which is now called 'the devourer of ice' would become its principal feeder.

"If we thus embrace Escher's theory, as accounting in no small degree for the vast size of the extinct glaciers of Switzerland and northern Italy, we are by no means debarred from accepting at the same time Charpentier's suggestion, that the Alps in the glacial period were 2,000 or 3,000 feet higher than they are now. Such a difference in altitude may have been an auxiliary cause of the extreme cold, and seems the more probable now that we have obtained unequivocal proofs of such great oscillations of level in Wales within the period under consideration. We may also avail ourselves of another source of refrigeration which may have coincided in time with the submergence of the Sahara, namely, the diversion of the Gulf-stream from its present source. The shape of Europe and North America, or the boundaries of sea and land, departed so widely in the glacial period from those now established, that we cannot suppose the Gulf-stream to have taken at that period its present north-western course across the Atlantic. If it took some other direction, the climate of the north of Scotland would, according to the calculations of Mr. Hopkins, suffer a diminution in its average annual temperature of 12° Fahr., while that of the Alps would lose 2° Fahr." A combination of these and other conditions, which might be enumerated, would certainly be attended with so great a revolution in climate as might go far to account for the excessive cold which was developed at so modern a period in the earth's history.

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"The more we study and comprehend the geographical changes of the glacial period, and the migrations of animals and plants to which it gave rise, the higher our conceptions are raised of the duration of that subdivision of time, which, though vast when measured by the succession of events comprised in it, was brief if estimated by the ordinary rules of geological classification. The glacial period was, in fact, a mere episode in one of the great epochs of the earth's history; for the inhabitants of the lands and seas, before and after the grand development of snow and ice, were nearly the same. As yet we have no satisfactory proof that man existed in Europe or elsewhere during the period of extreme cold; but our investigations on this head are still in their infancy. In an early portion of the post-glacial period it has been ascertained that man flourished in Europe; and in tracing the signs of his existence, from the historical ages to those immediately antecedent, and so backward into more ancient times, we gradually approach a dissimilar geographical state of things, when the climate was colder, and when the configuration of the surface departed considerably from that which now prevails.

"Archæologists are satisfied that in central Europe the age of bronze weapons preceded the Roman invasion of Switzerland: and prior to the Swiss-lake dwellings of the bronze age were those in which stone weapons alone were used. The Danish kitchen-middens seem to have been of about the same date; but what M. Lartet has called the reindeer period of the South of France was probably anterior, connected with a somewhat colder climate. Of still higher antiquity was that age of ruder implements of stone such as were buried in the fluviatile drift of Amiens and Abbeville, and which were mingled in the same gravel with the bones of extinct quadrupeds, such as the elephant, rhinoceros, bear, tiger, and hyena. Between the present era and that of those earliest vestiges yet discovered of our race, valleys have been deepened and widened, the course of subterranean rivers which once flowed through caverns has been changed, and many species of wild quadrupeds have disappeared. The bed of the sea, moreover, has in the same ages been lifted up, in many places hundreds of feet, above its former level, and the outlines of many a coast entirely altered.

"MM. de Verneuil and Louis Lartet have recently found, near Madrid, fossil teeth of the African elephant, in old valley-drift, containing flint implements of the same antique type as those of Amiens and Abbeville. Proof of the same elephant having inhabited Sicily in the Postpliocene and probably within the Human period had previously been brought to light by Baron Anca, during his exploration of the bone-caves of Palermo. We have now, therefore, evidence of man having co-existed in Europe with three species of elephant, two of them extinct (namely, the mammoth and the *Elephas antiquus*), and a third the same as that which still survives in Africa. As to the first of these—the Mammoth—I am aware that some writers contend that it could not have died out many tens of thousands of years before our time, because its flesh has been found preserved in ice, in Siberia, in so fresh a state as to serve as food for dogs, bears, and wolves; but this argument seems to me fallacious. Middendorf, in 1843, after digging through some thickness of frozen soil in Siberia, came down upon an icy mass, in which the carcase of a mammoth was imbedded, so perfect that, among other parts, the pupil of its eye was taken out, and is now preserved in the Museum of Moscow. No one will deny that this elephant had lain for several thousand years in its icy envelope; and if it had been left undisturbed, and the cold had gone on increasing, for myriads of centuries, we might reasonably expect that the frozen flesh might continue undecayed until a second glacial period had passed away.

"When speculations on the long series of events which occurred in the glacial and postglacial periods are indulged in, the imagination is apt to take alarm at the immensity of the time required to interpret the monuments of these ages, all referable to the era of existing species. In order to abridge the number of centuries which would otherwise be indispensable, a disposition is shown by many to magnify the rate of change in prehistoric times, by inventing the causes which have modified the animate and inanimate world with extraordinary and excessive energy.

"I will now briefly allude, in conclusion, to two points on which a gradual change of opinion has been taking place among geologists of late years. First, as to whether there has been a continuous succession of events in the organic and inorganic worlds, uninterrupted by violent and general catastrophes; and secondly, whether clear evidence can be obtained of a period antecedent to the creation of organic beings on the earth. I am old enough to remember when geologists dogmatised on both these questions in a manner very different from that in which they would now venture to indulge. I believe that by far

the greater number now incline to opposite views from those which were once most commonly entertained. On the first point it is worthy of remark that although a belief in sudden and general convulsions has been losing ground, as also the doctrine of abrupt transitions from one set of species of animals and plants to another of a very different type, yet the whole series of the records which have been handed down to us are now more than ever regarded as fragmentary. They ought to be looked upon as more perfect, because numerous gaps have been filled up, and in the formations newly intercalated in the series we have found many missing links and various intermediate gradations between the nearest allied forms previously known in the animal and vegetable worlds. Yet the whole body of monuments which we are endeavouring to decipher appears more defective than before. For my own part, I agree with Mr. Darwin in considering them as a mere fraction of those which have once existed, while no approach to a perfect series was ever formed originally, it having never been part of the plan of Nature to leave a complete record of all her works and operations for the enlightenment of rational beings who might study them in after-ages.

"In reference to the other great question, or the earliest date of vital phenomena on this planet, the late discoveries in Canada have at least demonstrated that certain theories founded in Europe on mere negative evidence were altogether delusive. In the course of a geological survey, carried on under the able direction of Sir William E. Logan, it has been shown that northward of the river St. Lawrence there is a vast series of stratified and crystalline rocks of gneiss, mica-schist, quartzite, and limestone, about 40,000 feet in thickness, which have been called Laurentian. They are more ancient than the oldest fossiliferous strata of Europe, or those to which the term primordial had been rashly assigned. In the first place, the newest part of this great crystalline series is unconformable to the ancient fossiliferous or so-called primordial rocks which overlie it, so that it must have undergone disturbing movements before the latter or primordial set were formed. Then again the older half of the Laurentian series is unconformable to the newer portion of the same. It is in this lowest and most ancient system of crystalline strata that a limestone, about a thousand feet thick, has been observed, containing organic remains. These fossils have been examined by Dr. Dawson, of Montreal, and he has detected in them, by aid of the microscope, the distinct structure of a large species of Rhizopod. Fine specimens of this fossil, called *Eozoon Canadense*, have been brought to Bath by Sir William Logan, to be exhibited to the members of the Association. We have every reason to suppose that the rocks in which these animal remains are included are of as old a date as any of the formations named azoic in Europe, if not older, so that they preceded in date rocks once supposed to have been formed before any organic beings had been created.

"But I will not venture on speculations respecting 'the signs of a beginning,' or 'the prospects of an end,' of our terrestrial system—that wide ocean of scientific conjecture on which so many theorists before my time have suffered shipwreck. Without trespassing longer on your time, I will conclude by expressing to you my thanks for the honour you have done me in asking me to preside over this meeting. I have every reason to hope, from the many members and distinguished strangers whom I already see assembled here, that it will not be inferior in interest to any of the gatherings which have preceded it."

A vote of thanks to Sir Charles Lyell was proposed by the Mayor of Bath, seconded by Sir Roderick Murchison, and carried by acclamation.

THE DUBLIN INTERNATIONAL EXHIBITION IN 1865.

In order to secure an adequate representation of the Manufactures and Industries of the United Kingdom, the executive have applied to the Society of Arts for their assistance; and, with the sanction of the Council, a committee of advice has been formed in London to promote, as far as possible, the success of the Exhibition. The following gentlemen have kindly consented to act on this committee:—Messrs. J. Anderson; R. K. Bowley; E. A. Bowring, C.B.; Antonio Brady; Sir David Brewster, F.R.S.; Henry Cole, C.B.; Sir C. Wentworth Dilke, Bart.; Messrs. Thos. Fairbairn; J. H. Foley, R.A.; Geo. Godwin, F.R.S.; George Grove; William Hawes, Chairman of the Council of the Society of Arts; R. Hudson, F.R.S.; Owen Jones; Charles Manby, F.R.S.; P. C. Owen; Hon. B. F. Primrose; S. Redgrave; Sir Cusack P. Roney; Sir F. R. Sandford; Messrs. R. A. Thompson; E. Waterton; J. Way; G. F. Wilson, F.R.S.; Thos. Winkworth; M. Digby Wyatt; P. Le Neve Foster, M.A., Hon. Sec. The Council, desiring to render such support as may be in their power, have acceded to the request of the committee to be permitted the use of the Society's house for the transaction of business.

The building in which the Exhibition will be held is fast approaching completion. Designed to give to the inhabitants of Dublin similar facilities for recreation and instruction to those which the Crystal Palace offers to Londoners, the Exhibition Palace and Winter Garden will be found well adapted for an effective display both of Art and Industry. A number of Irish noblemen and gentlemen, anxious to take advantage of the opportunity presented to them by the erection of this building, have patriotically come forward to give their support and countenance to an undertaking which promises to be so beneficial to Arts and Manufactures in their own country. The General Committee under whose auspices the Exhibition will be inaugurated includes some of the most influential and distinguished public men in Ireland, and a thoroughly national character is thus guaranteed to the undertaking. On this Exhibition Committee are found, among others, the names of the Lord Chancellor of Ireland, Duke of Leinster, Earl of Rosse, Earl of Charlemont, Earl of Clancarty, Viscount Gough, Viscount Powerscourt, Lord Talbot de Malahide, Sir George Hodson, Sir R. Griffith, Sir Robert Kane, the Lord Mayor of Dublin, Hon. St. John Butler, Hon. J. P. Vereker, Messrs. B. L. Guinness, W. Dargan, Gilbert Sanders, F. W. Brady, J. Lentaigne, W. Le Fanu, &c., some of whom are already favourably known by their co-operation in the Dublin Exhibition of 1853.

The executive have entered into an arrangement with the company who have erected the building, under the terms of which the Exhibition Palace and Winter Garden will be placed at their disposal for the period of the exhibition. Out of the receipts the company will be repaid any cost they have been put to for additional buildings erected for the purposes of the Exhibition, and will also receive a certain fixed sum for the use and wear and tear of their premises. Any surplus remaining after these charges have been defrayed will be applied to the purposes of National Industry and Art, according to the direction of the Exhibition Committee.

Offers and assurances of support have been received from many of the large towns and manufacturing districts on the Continent, and applications for space have been made by several of the principal manufacturers in England.

Although not on so large a scale as the Great Exhibitions of 1851 and 1862, the Dublin International Exhibition of 1865 may be easily made both attractive and successful. Every attempt which is made to turn the attention of the Irish people to Arts and Manufactures is deserving of sympathy and support, and it is to be hoped that the artists and manufacturers of the United Kingdom will on this occasion give their best co-operation.

UTILISATION OF SEWAGE OF TOWNS.

A select committee of the House of Commons sat in May, June, and July of the present year to inquire into plans for dealing with the sewage of the metropolis and other large towns, with a view to its utilisation for agricultural purposes. The committee examined a great number of witnesses, and the report agreed to, and just published, is as follows:—

"The committee commenced their inquiry by examining into all those plans for utilising, in a liquid state, the sewage of the metropolis, which had been laid before the Metropolitan Board of Works, and were referred to the committee by an order of the House. The committee have ascertained, from Cornish engineers of the greatest reputation, the prices of the steam-engines and pumps which would be required to raise various quantities of sewage to stated heights. Mr. Bateman, the well-known water engineer, was examined as to the prices of the mains and pipes which would be necessary for the conveyance and distribution of sewage over land, and the estimated cost of laying them down and jointing them. The committee has come to the conclusion that it is not only possible to utilise the sewage of towns, by conveying it in a liquid state through mains and pipes to the country, but that such an undertaking may be made to result in pecuniary benefit to the ratepayers of the towns whose sewage is thus utilised. That benefit may, in a few years, be greatly increased, for the amount of artificial manures is even at present insufficient, and the sources whence some of the most important are obtained will in a few years be exhausted. Other means of fertilising land must, therefore, be resorted to.

"The committee, having examined the chairman and engineer of the Metropolitan Board of Works, are of opinion that more might have been done by that Board towards the profitable use of the sewage of London; and that the completion of the outfall sewerage of the metropolis ought, at the earliest possible moment, to be followed by the adoption of a system which may convert that sewage from a nuisance into a permanent and increasing source of agricultural fertility.

"Even if a pecuniary benefit were not to be secured, yet such a consideration should not deter local authorities from taking such steps as are possible to free rivers from pollution.

"The committee examined several witnesses regarding the pollution of the rivers and streams of the country. There can be no doubt as to the injury which results from the practice of conducting sewage and other refuse matters into the rivers, whence numerous towns, villages, and country populations derive their water supply. It is imperatively necessary that such a practice should be discontinued. No efficient artificial method has been discovered to purify, for drinking and culinary purposes, water which has been once infected by town sewage. By no known mechanical or chemical means can such water be more than partially cleansed; it is always liable to putrefy again. Processes of filtering and deodorisation cannot, therefore, be relied upon to do more than mitigate the evil. Water which appears perfectly pure to the eye is sufficient, under certain conditions, to breed serious epidemics in the population which drinks it. Soils, however, and the roots of growing plants, have a great and rapid power of abstracting impurities from sewage water, and rendering it again innocuous and free from contamination. Mr. Ffennell, the chief inspector of fisheries, stated in his evidence that sewage water in a putrefying state is destructive to fish. A considerable increase in the amount of food for the people, and of revenue to the owners of rivers would, therefore, result from purifying the rivers of the United Kingdom, which are now contaminated by sewage and other matters.

"If the sewage of towns is no longer to flow into rivers, the only alternative which remains is to dispose of it on the land.

"It has been decided that it is a nuisance at common law to discharge any sewage into a river. Yet the law is, nevertheless, inoperative, for want of powers to remove the nuisance.

"Until within the last thirty years it has been the custom to utilise all the nightsoil and other refuse on the land. Great obstructions used to be thrown in the way of making house drains which should empty themselves into the street sewer. The use of the latter was confined to the conveyance of the surface waters of the towns. There was a service of scavengers, whose duty it was to remove excrementitious matters in their carts; and it was the office of the mayors of towns to take care that rivers, streams, and ponds were kept free from all noxious or filthy substances. But when the modern water-closets came into vogue, and the practice was introduced of flushing house drains into the sewers, then the diluted nightsoil first began to find its way into rivers. Yet the removal of house refuse to the land would now be much easier and cheaper than it was formerly, because carriage by suspension in a liquid is the cheapest mode of transport.

"In many towns of Lancashire there are to this day numerous cess-pits. This is the case with Manchester, where the local authorities expend about £20,000 a year for emptying them, and then removing the contents to the land, and receive back 50 per cent. by the sale of the material. A system of sewerage, and the necessary works to remove all the refuse in a liquid state to the adjacent fields, would, in Mr. Rawlinson's opinion, cause a saving to the town.

"The Commissioners of Sewers and the Board of Health took no steps to prevent the introduction of the practice of flushing the refuse of houses into the street sewers, and thence into the rivers. For they were of opinion that no time should be lost in freeing habitations from the dangerous infection of putrefying substances; and assumed that when this more pressing object had been accomplished the law would be again respected, and measures would be taken to free the rivers and restore the refuse once more to the land.

"Dwelling-houses in the metropolis and many parts of England have already been freed, which has caused the increased pollution of rivers. This latter evil is becoming worse every year in proportion to the adoption of a better water supply, of a more perfect system of house drainage, and the increase of the population.

"Dr. Acland and other witnesses believe that rivers can be effectually freed from pollution only by extending the Local Government Act to entire watersheds; or, rather, by establishing boards somewhat similar to the present local boards of towns, which should extend over the whole area of each catchment basin, instead of being restricted to the precincts of each town. These watershed or catchment boards should, in the opinion of those witnesses, have all the powers for this purpose which are now enjoyed by the local boards of towns: and they should be placed under the direct authority and supervision of the Home Office. They, furthermore, hold that it should be the duty of the Home Secretary to see that the law as to the pollution of streams is strictly enforced by these watershed boards.

"The secretary of the local government office, as well as Mr. Rawlinson, the inspecting engineer, while concurring in the necessity of appointing a board for each catchment basin, gave a decided opinion that the duty of the watershed board should be merely to supervise the action of the local boards within their district, and enforce an obedience to the law in causing them to desist from polluting the streams, but that the necessary works should be carried out by the local boards alone.

"The committee recommend that the important object of completely freeing the entire basins of rivers from pollution should be rendered possible by general legislative enactment, enabling the inhabitants of such entire districts to adopt some controlling power for that purpose; but it should include a provision for compelling

local boards to render the sewage of their districts innocuous by application to the land for agricultural purposes. The case of the valley of the Thames (where the purification of the river, which has been sought by the expenditure of enormous sums, is to a considerable extent counteracted by the increased discharge of sewage from the towns higher up the streams) requires special and immediate attention.

"Before concluding the inquiry the committee received some evidence with regard to the measures now being carried out by the Metropolitan Board of Works for diverting the sewage of the metropolis. This inquiry the committee have been unable to complete."

THE PATENT-OFFICE.

The report of the Commons' Select Committee appointed to inquire as to the most suitable arrangements to be made respecting the Patent-office, library, and museum has been printed. The committee, in the first place, report that the present office is totally wanting in the accommodation requisite for giving full effect to the Patent Law Amendment Act, 1852, and the patent system generally. For this purpose suitable apartments for the Commissioners, law officers, and clerks, with a record-office and rooms for inspecting provisional specifications, drawings, and scientific publications, should at once be provided; the place now used for the inspection of classifications and drawings is little better than a dark passage, in which there is barely standing room. With regard to the library, the committee have found that it is one of great value and utility, but that its utility is seriously impaired by its crowded state and the want of sufficient attendants. The inconvenience to those who frequent the office and library arising from this state of things is such as to render some remedy imperatively necessary. The committee consider that the want of increased accommodation in respect of the Patent-office and library is so much felt as to prejudice the due administration of the patent law, and they therefore recommend that sufficient office-room, with an additional reading-room and an extension of the library, should be provided with the least possible delay. The committee further recommend that the library should on no account be separated from the office. All witnesses concur in this opinion.

The second point to which the Committee directed their attention was that of the Patent Museum. The Committee found that the Patent Museum was formed by Mr. Woodcroft, the Superintendent of Specifications, by the request of the Commissioners of Patents, and that it consists of models and machines, belonging partly to the Commissioners of Patents, partly to the Commissioners of the Exhibition of 1851, and partly to Mr. Woodcroft himself and various private persons. This collection has been exhibited since 1857 in the iron building at South Kensington. It occupies a floor space of only 6,700 feet, and is too much overcrowded for classification or for due inspection by visitors. The Committee are of opinion that the term "Patent Museum" tends to give an erroneous opinion as to its character and object. The Committee are of opinion that any special collection of patented inventions made for the purpose of evidence, illustration, or record of patent rights is not so connected with a general museum of mechanical inventions as to render the neighbourhood of such a museum to a patent office and library or law courts necessary. It appears to the committee that the chief purposes of a general museum is to illustrate and explain the commencement, progress, and present positions of the most important branches of mechanical invention; to show the chief steps by which the most remarkable machines have reached their present degree of excellence; to convey interesting and useful information, and to stimulate invention.

The Committee proceed to say that, in forming an illustrative collection of inventions, it would be necessary to adopt the principle of selection. This, however, does not appear to the Committee to be an insuperable objection, especially as no one proposes to substitute models for specifications, which, for all the purposes of administering the patent law, would still have to be consulted, and bear the stamp of authority. Such a collection should contain a selection of models of moderate size which should illustrate different departments of inventions, and also a selection of models of current patented inventions. This collection should be exhibited in connection with the Patent-office.

As regards the Patent-office—that is to say, the office, library, and last mentioned collection, the following are the sites respecting which their inquiries have been chiefly directed.—1. Chancery-lane.—This is a block of land, occupied principally by old and dilapidated houses, and surrounded by Southampton-buildings, Chancery-lane, Cursitor-street, and Took's-court. It is most conveniently placed, being in close proximity to the law-courts at Lincoln's-inn, the Inns of Court, and the New Record-office. Another site, immediately adjoining that last named was suggested; it extends to the north side of the Record-office. Should the plan for concentrating all the law courts in the neighbourhood of Chancery-lane, which has been recently under the consideration of Government, be carried into effect, it will afford an additional argument in favour of either site. The cost of the first-named site, amounting to 5,878 yards, was estimated at £205,000. 2. Fife-house.—This block consists of Fife-house (in which the East India Museum is now placed), an adjoining garden, and some small houses. It contains in all about two acres, and appears to the committee to be well situated for the buildings in question. The committee, however, do not consider that it offers as many advantages as the Chancery-lane site would afford, being more distant from the law courts and offices. This has been estimated at the price of £52,800 per acre. 3. Victoria-street.—This consists of a block of land in Victoria-street, which would afford sufficient space for the proposed buildings, but the committee do not consider that the situation would be as convenient as either of the two last-named sites for inventors, professional men, and others who would principally resort to it. This site is estimated at £66,000. It contains an area of nearly an acre and a quarter. 4. Trafalgar-square.—This has been recommended by some witnesses; but, having regard to the recent decision of the House upon the subject of the National Gallery, the committee did not feel justified in entertaining the proposition. 5. South Kensington.—Ample space may be afforded in the vicinity of the present museum for a general museum of mechanical inventions. The land of this site is vested in Government for purposes connected with science and art, but the committee have ascertained that the land in this neighbourhood is of a high value.

The report proceeds to state that on a full consideration of the advantages and disadvantages of these sites the committee have arrived at the conclusion that the balance of advantages in favour of the neighbourhood of Chancery-lane outweighs that of the others, and they therefore recommend it for adoption. The committee find that the surplus of revenue beyond expenditure on the balance of accounts of the fees payable by stamps under the provisions of the Patent Law Amendment Act, 1852, has amounted to £173,044 up to the end of 1862, and that the surplus for the year 1863, of which the accounts have not yet been published, is estimated to amount to £37,000, making, up to the end of last year, a total surplus revenue of £210,044 [the Patent-office report just issued states last year's surplus to be £43,968.] The committee consider that the principal object of the fees payable under the provisions of the Patent Law Amendment Act was to provide for the proper working of that measure, and not for the purpose of increasing the general revenue of the

country. Without entering upon the question whether or not a claim exists to have the surplus exclusively devoted to the purposes of the Act of 1852, the committee are of opinion that for the future the annual surplus revenue accruing from the operation of that Act should be so supplied to the extent which may be necessary.

Fine Arts.

Art Exhibition at Malines.—An exhibition (referred to in a former number) of works of Christian art of the mediæval and renaissance periods, on loan from churches, corporations, and private collections, is now being held at Malines, under Government patronage, and will remain open until September 25. It includes ivory carvings, enamels of the 12th century, gold and silver work, niello-work, Mosaics, tapestry, &c. The price of admission is one franc.

School of Fine Arts, Paris.—The annual exhibition of the works of the pupils in painting, sculpture, architecture, and line engraving, is announced to take place on the 21st of the present month of September; this exhibition only remains open for five days.

Architectural Prize.—The Duc de Valmy has placed at the disposal of the Academy of Fine Arts the sum of 1,500 francs, to be given to the author of the best essay on a general question of architecture; the academy has in consequence published the following theme:—"To explain principles and rules of architecture; to develop the theory of the art as applicable to our epoch." The essays are to be sent in on or before the 15th July, 1865.

Manufactures.

Flax in Ireland.—Lord Lismore, in a speech made on the occasion of the Clogheen Union Farming Society's Show, recently held at Cahir, in the county of Tipperary, dwelt particularly upon the cultivation of flax, about which there is much difference of opinion among the landlords. Some consider the interest felt about it to be a mania, which will soon pass away; and they ask, if the Irish small farmers have never been able to treat their land properly for ordinary crops, how could they be expected to do so for a crop which requires so much care as flax? Lord Lismore first combated the idea that the demand for flax depended mainly on the cotton famine, and would cease on the restoration of peace in America. Quoting the Board of Trade returns, he showed that in 1853 the importation of flax from Russia and Belgium was £3,300,000. Since that time it had increased to £6,000,000, and he asked was it not reasonable that the Irish farmers should try to get some portion of that sum which was paid for the raw material of our linen manufacture, and at the same time vastly extend employment to those who were leaving the country in thousands for the want of it. They had got in that Union this year 350 acres of flax, which was reported to be an excellent crop, both in quantity and quality. They had started a new scutch-mill, and since they began to scutch they had four different offers to buy all the flax grown in the union—two from Belfast, one from Limerick, and one from Dundalk. They had an offer from a Dublin merchant to buy up the whole of their seed, and an offer from a Belfast merchant to buy up the whole of their refuse tow. There would, therefore, be no want of a market and good prices. A tenant of his had grown an acre of flax, on which he had saved twenty-eight bushels of prime seed, for which he would get 5s. a bushel, which would be £7 an acre, more than the value of a crop of oats, leaving the flax itself a clear gain. Another tenant fed his calves with his seed, and never had such calves in his life. Beginning in a small way, they would go on until he had no doubt they would make a great revolution in the industrial resources of the country.

Atmospheric Steam Hammer.—An atmospheric hammer and stamp is now being shown in operation in Birmingham, under the supervision of the patentee, Mr. Grimshaw. Its mode of working is as follows:—An air-pump is worked by a band from a shaft, and forces air into a reservoir, which is so constructed as to form the framework of the machine. The reservoir, in its turn, communicates with a cylinder, in which a piston works with so little friction that it can be moved up and down by hand. This piston is, in fact, the hammer, inasmuch as at the end of it is fitted a head, which may be varied in form to suit any kind of work. The shaft, on which is fixed the pulley-wheel to which the pump crank is geared, has another wheel fitted upon it, which performs a very important operation. By means of a screw or lever (either will do), the last-named wheel can be so moved to or from the the centre of the revolving plate, which is attached to the "cut off" valve, that the speed of the hammer can be varied entirely at the discretion of the operator. This wheel and plate work at right angles to one another, and when not in contact the hammer does not work. The reservoir is capable of bearing great pressure, and will store up, so to speak, a large amount of power, until it is wanted for a series of smashing blows. A valve attached to this reservoir prevents it bursting, and appears to be a valuable assistant means of regulating and varying the action of the hammer; and if it is true that these atmospheric hammers and stamps can be worked with much less power than steam stamps, costing less in the first instance, they cannot, from the simplicity of their construction, cost nearly so much to keep in repair.

Commerce.

French and Belgian Tariffs.—Reduction of Import Duties on British Produce and Manufactures.—By virtue of the provisions in the commercial treaties between this country and France and Belgium, for the reduction of certain import duties in the tariffs of those countries on the 1st October, 1864, the rates of duty levied on the under-mentioned articles will experience a considerable diminution from the 1st October next:—In France—On jute yarns, jute tissues, woollen tissues, iron and steel and wares thereof, brass and copper and wares thereof, lead and wares thereof, zinc and wares thereof, earthen and stonewares, chemicals, perfumery, paper, and ships and boats. In Belgium—On cotton yarns, linen yarns, jute yarns, woollen yarns, cotton prints, woollen tissues, iron and steel and wares thereof, brass and copper wares, and chemicals. The actual amounts of the duties in force from the above-mentioned date will be found in parliamentary paper, No. 493, of session 1863, parts 1 to 10, which may be purchased for a few pence at the office for the sale of parliamentary papers.

Vintage in France.—A letter from Montpellier, of the 4th instant, states that the long drought promises, according to the vinegrowers, a vintage of excellent quality but deficient in quantity. There has at last been a fall of rain of short duration, but it has not been injurious to the gathering of the grapes, which has commenced in several of the vineyards in the neighbourhood of the town. The vintage has commenced in the greater part of the department of the Gard, and it is expected that the produce will be equal in quantity to that of the best years, and that the quality will be excellent. The proprietors of vineyards were apprehensive that the crop would be deficient in consequence of the very dry summer, but the rain which fell last month swelled the grapes and repaired the injury they had previously sustained.

Supply of Raw Silk.—The silk trade in France seems to be in almost as much difficulty with respect to raw material as its sister cotton manufacture. The culture of silk in France has long been in an unsatisfactory condition, the supply falling short of the demand or the

price rising from time to time to a ruinous pitch. Great efforts have been made in various directions to increase the produce; silkworm eggs have been fetched from China and other places, with great care and cost, and many new kinds of eggs have been introduced from abroad with the hope of obtaining more hardy and more productive worms. The *Magnanerie*, as a silkworm nursery is called, in the *Jardin d'Acclimatation* in the Bois de Boulogne of Paris, is just now an object of considerable attraction, and contains many thousand worms of various kinds, and amongst others the *Bombyx mori* of China, and the *B. blanche* of Japan, which feed on the leaves of the mulberry; the *Bombyx cynthia vera* and the *B. Arrindia*, which live on the castor-oil plant and the leaves of the *Ailanthus*, or Japan varnish tree; and the *Bombyx Yamamaï* and *B. Permyi* of China and Japan, which devour oak leaves. These two latter are in the open air, and hopes are entertained that they may acclimatise in Western Europe. There is also another establishment adjoining the Imperial model farm of Vincennes, where M. Guérin-Méneville—whose exhibition of some of these worms and their produce in the French department of the London Exhibition of 1862 excited considerable attention—is pursuing their cultivation with a view to practical results. In the meantime, the want of the eggs, or seed as it is called, of the silkworms already cultivated in France, is great, and apparently very difficult to supply. Not long since some adventurous persons announced their intention of seeking a supply of eggs in Independent Tartary, but they were warned by the Ministry of Commerce that it would expose themselves to great danger in that country, and therefore renounced their project. News has since been received from Teheran, by the Minister of Commerce, that there would be a better chance of success in Persia, and the attention of cultivators is now directed to that country. It appears, however, that several parties have set out on this errand from Constantinople, but have been deterred from proceeding by information which they obtained at Tiflis. The opinion seems to be that interested speculators in silk have managed, for their own interest, to prevent the French agents from obtaining a supply of the eggs. Be that as it may, it is certain that the trade in silkworm eggs is but little developed, although the demand is very great in Europe, and in spite of the success which has attended the importations which have been made from China. The cultivation of silk is carried on in five provinces of Persia, Meshed, Yezd, Cachan, Mazenderan, and Ghilan, but the quantity and quality differ greatly. The worms obtain little of the care which is bestowed upon them in France, where the duties of the sericulteur are constant and most troublesome. In Persia the worms are placed on rough wooden stages, and, being supplied with plenty of food, are left almost to themselves till the spinning time arrives; yet is is said that the disease which has attacked the worms so seriously in France is not known in Persia. The inference drawn is that the Persian silk worm is more hardy than those reared in France. The statistics of the culture in the former country are not very complete, for the French authorities have been unable to procure even an approximate estimate of the amount of silk produced in more than three of the above-named provinces. Cachan is said to yield only 750 kilogrammes—an insignificant quantity—Yezd, 21,000 kilos.; and Ghilab, 206,000 kilos.; in all about 478,000 lbs. English.

Colonies.

Mortality in the Sydney Suburbs.—The *Sydney Morning Herald*, June 18, says:—"Before we can compute the proportion which the number of registered deaths bears to the number of persons living, we must, of course, carefully estimate the numbers of the population from the best data within our reach. As regards the city and suburbs of Sydney, the population in each of the years between the censuses of 1856 and 1861 cannot be more fairly estimated than by assuming that the annual rate of the ascertained increase had been uniform throughout the interval. The first of the annexed tables shows the population in the middle of the year, estimated on the principle above explained, and the number of deaths registered; the second gives the rate of mortality in each of the years, with the mean of the three; and the third the rate in each of the four seasons.

TABLE I.

Estimated Population in the Middle of each Year, and Number of Deaths registered in each Year.

Suburbs.	1861.	1862.	1863.
Whole suburbs, Population	37,301	39,300	41,406
,, Deaths ...	596	789	846
Balmain ....Population	3,991	4,205	4,432
,, Deaths ...	63	81	84
Glebe ....Population	3,768	3,969	4,182
,, Deaths ...	66	105	87
Newtown ......Population	4,290	4,520	4,761
,, Deaths ...	68	98	87
Redfern ....Population	6,789	7,153	7,636
,, Deaths ...	136	209	241
Paddington......Population	6,863	7,231	7,618
,, Deaths ...	98	125	160
Concord ....Population	9,387	2,515	2,650
,, Deaths ...	41	50	53
St. George ......Population	5,707	6,013	6,335
,, Deaths ...	74	78	94
St. Leonards ...Population	3,506	3,694	3,892
,, Deaths ...	50	43	40

TABLE II.

Annual Rates of Mortality to 1,000 Persons Living.

Suburbs.	1861.	1862.	1863.	Mean.
Whole suburbs	16·0	20·1	20·4	18·8
Balmain	15·8	19·3	19·0	18·0
Glebe	17·5	26·4	20·8	21·6
Newtown	15·9	21·7	18·3	18·6
Redfern	20·0	29·2	32·0	27·1
Paddington	14·3	17·5	21·0	17·6
Concord	17·2	19·9	20·0	19·0
St. George	13·0	13·0	14·8	13·6
St. Leonards	14·3	11·7	10·3	12·1

Of the nine suburbs of London, the most favoured is Hampstead, whose death-rate is 17·6 per thousand; the least favoured Chelsea, 26·6 per thousand. The most healthy of the suburbs of London is thus less healthy than the healthiest of ours by 8·1 per thousand; and the least healthy of the London suburbs more healthy than the least healthy of ours by 0·9."

Revenue of New South Wales.—From a comparative statement of the Consolidated Revenue of this colony, and of the special funds paid into the Treasury at Sydney during the quarters ended 31st March, 1863 and 1864 respectively, it appears that the total revenue proper for the first quarter of the year 1864 amounts to £290,305 6s. 5d., against £337,038 14s. for the corresponding quarter of the year 1863. The decrease on the quarter is, therefore, £46,733 7s. 7d., or nearly 14 per cent. The principal heads of revenue which show a decrease are the customs, £24,274; duty on spirits distilled in the colony, £7,246; gold, £5,664; land, £27,302; electric telegraph receipts, £1,552. There is also a small decrease in the revenue derived from the mint

receipts of £83; licenses, £276; fines and forfeitures, £151; and rates under Chinese Act, £40. The heads of revenue which show an increase are—duty on refined sugar and molasses, £7,333; postage, £951; commission on money orders, £237; fees of office, £30; rents, exclusive of land, £1,090; railways, £3,852; pilotage rates, harbour dues, and fees, £209; tonnage dues, Newcastle, £12; interest on city debentures, £5,000; and miscellaneous receipts, £1,068. In the Customs' revenue the falling off is in the receipts from spirits, wine, tobacco, tea, sugar and molasses, and coffee and chicory; but from ale and beer, opium, and other articles there is an increase. For duty on spirits distilled in the colony there have been no receipts this quarter, and this accounts for the large decrease; but on the other hand there is almost a similar amount collected for duty on refined sugars and molasses, against nil for the first quarter of 1863. Under the head of gold, the decrease is in the duty on gold, leases of auriferous lands, miners' rights and business licenses; but for fees for escort and conveyance of gold there is a small increase of £94. With regard to the land revenue, the principal decrease is in the amount derived from the land sales. For the first quarter of 1864 the receipts amounted to only £24,775 against £52,135 in 1863, the decrease being £27,360. The rents of land for pastoral purposes and assessment on runs show an increase, but from quit rents, licenses to cut timber, &c., on crown lands and mineral leases there is a decrease. There is a steady increase of about eight per cent. on the postage receipts, but the commission on money-orders has reached £255 during the past quarter, against £18 for the corresponding quarter of 1863. Under the head of rents, exclusive of land, which includes tolls and ferries, wharfs, military canteen, Government buildings, and Glebe Island Abattoir, the receipts amount to £6,232 against £5,143 in 1863. It is satisfactory to find that the railway tolls show an increase of £3,852, or 13 per cent., the receipts being £32,587 against £28,735; but from the electric telegraph receipts there is a decrease for the first time of £1,552 or 17 per cent. Under the head of Interest on City Debentures there is a sum of £5,000 for the first quarter of 1864 against nil in 1863. Special receipts in the present statement published by the Government include immigration remittances, which formerly appeared under the head of revenue proper, but the difference in the past quarter and that of 1863 is only £496. There is a new item—Imperial postage, £4,955 against nil in 1863. The total amount received under the head of special receipts for the first quarter of 1864 is £15,511 against £9,585 in 1863, which is an increase of £5,925 on the quarter.

New Zealand Industrial Exhibition.—The Local Committee of the New Zealand Industrial Exhibition meet weekly, and have done good service in waiting upon the classes likely to send articles for exhibition. There is every reason to suppose that the industry and talent of Otago will be well represented. At the meeting of the Committee, on Wednesday, 11th May, it was stated that 139 applications for space had been made, requiring an area of 7,000 square feet, and wall space equal to 3,761 square feet. Several tradesmen are preparing articles expressly for the Exhibition, of a most elaborate kind, tending not only to evince their own artistic skill but the capabilities of many native products to usefulness and ornamentation. The building for their reception is rapidly progressing, and the interest in the province appears to be on the increase.

New Zealand Gold Fields.—Accounts from gold fields, received since the publication of the last summary, are encouraging. The escort returns show that the increased yield of gold mentioned at that time has been maintained, and, although there has been some excitement among the miners in consequence of the glowing accounts of discoveries of gold in the province of Marlborough, and several have left to try their fortunes there, the inducements scarcely appear sufficient to warrant the idea that they will be recompensed for their change of place, as the gold fields of Otago, when skilfully and persistently worked, afford ample return for labour. The various circumstances under which gold is found in the province of necessity render slight fluctuations in the year inevitable. The rocks in which it is embedded yield to atmospheric and thermatic atmospheric influences, and, crumbling under the combined action of frost, air, and water, are washed down by the mountain torrents into the river beds. When, therefore, the river workings are practicable, they give in return for efforts an almost incredible quantity of gold; but, from their very nature, they are uncertain and fitful. The quantity of gold exported from the province of Otago during the current year to this date is 217,511 ozs. 8 dwts. The quantity exported previously is as follows:—

	ozs.
1861	187,695
1862	397,602
1863	580,233
	1,165,530

Making a grand total of 1,388,041 ozs. 8 dwts. The escorts have brought down 191,379 ozs. 16 dwts. It is the general conviction of those qualified, from local knowledge and previous occupation, to form an opinion, that a very large gold field exists in the Buller Valley. Gold digging, however, at present, is nearly confined to the River Mangles (80 or 90 miles from Nelson), the Matakitaki, and the Lyell. A few parties are also found scattered on the banks of the Buller itself. The whole digging population is supposed to be about 250. Those on the Matakitaki are estimated at about 110, who have hitherto confined themselves to the lower 20 or 25 miles of the river. They are almost entirely given to digging in the river bed, a very precarious operation. If the terraces, however, admit of being successfully worked there will be room for very many hands during the winter, and quite out of danger of floods. Indeed, the difficulty in that kind of work is rather the want than the excess of water. The terraces being generally deeply intersected by the water flowing across them to the river, the drawback to this mode of working for gold is the necessity of going a long way back for water to where the higher level of the stream admits of its being led to the top of the terrace at its edge, where alone it is said that diggers have a chance of success. Such terraces are now worked very encouragingly along the Buller and Lyell, and, should they generally prove profitable, will materially add to the extent of our workable gold fields. A visitor to the gold diggers is much struck by the great enterprise displayed by them. They have often to engage in undertakings requiring risk, skill, and patience, before the actual work of gold digging begins. An abundant supply of water is one of the necessities of the occupation, and has often to be brought considerable distances, through a difficult and very uneven country. In one instance, at the Lyell, five men, after having brought water more than half a mile, have to lead it first over a deep rock gully, and finally across the chasm of the Lyell itself, using for this purpose troughs, slung, at an elevation of 100 feet, to trees, the points of suspension being about the same number of feet apart.

Copper.—The first parcel of fine copper received from the smelting works at Cadiangullong mine (New South Wales), since the formation of the new company, has arrived in Sydney, and is to be sold by auction by Messrs. Mort and Co. It consists of ingots and cakes, amounting altogether to seven tons. The whole of this ore has been produced at the works since operations were commenced on the 15th ultimo.

Alpacas.—It is understood that the Acclimatisation Society lately formed in Canterbury, New Zealand, contemplates purchasing a number of the alpacas about to be sold by the New South Wales Government.

New South Wales.—The mining operations at Colombo and other points of the Shoalhaven River

(New South Wales) have recently been attended with a run of bad luck. The late sudden rise in the Upper Shoalhaven carried away a large quantity of mining implements, and in one case the sluice-boxes of one claim were floating about among heaps of timber, with the yield of the day in it, and only saved by swimming for it. Races which had taken some weeks to cut were broken up, and, on being repaired, were found utterly profitless. The recent floods have completed the wreck that this sudden rise had commenced, and the greater part of the miners have left.

Railways in New South Wales.—A contract will be taken shortly for a branch line, half-a-mile in length, connecting the Parramatta Railway, near Haslem's Creek, with the centre of the new cemetery. The line will enter the grounds from the Parramatta end, and will rise with a gradient of 1 in 44 and a curve of 18 chains radius; it will terminate in a dock 100 feet in length, the platform being level with the floor of the carriages.

Publications Issued.

Lessons in Elementary Botany, the Part on Systematic Botany, based upon Materials left in MS. by the Late Professor Henslow; with numerous Illustrations. By Daniel Oliver, F.R.S., F.L.S., &c. (*Macmillan and Co.*) 16mo., 317 pp.—Botanical text books abound in all directions and of all sizes, but, with few exceptions, are not expressed in terms sufficiently easy and elementary to be attractive to the large mass of those desiring to get an insight into the study, which is apt to dishearten men from its apparent abstruseness, arising from the mass of scientific terms employed and the learned discussions with which the earlier pages of the works are encumbered. Professor Oliver has endeavoured to avoid these difficulties. His first chapter is devoted to an examination of the common buttercup, and becomes a lesson in respect to the root, the stem, the leaves, the flowers, and the fruits of plants in general; and his second and third chapters, by means of the very same specimens, illustrate the principal functions of plants; while a fourth and fifth are devoted to a comparison of the buttercup with various other common familiar flowers, by which some notion of the differences of structure which occur amongst plants is plainly brought out. The sixth chapter explains the use of certain "flower schedules" largely employed in teaching by the late Professor Henslow—employed also by Professor Oliver, as he tells us, with much advantage in his own class, and strongly recommended by him both for private colleges and schools. The seventh chapter describes in further detail the various organs and their modifications; and the eighth, closing the first part, explains the minute structure and vital processes of plants. The second part of the book is devoted to the classification or systematic arrangement of plants, and in this portion much use is made of the schedules, one of them being devoted to a selected type of each natural order of our British flora. The learner is told not to be content with the examination of the plants used as types, but to try and refer every flowering plant which is met with to its type. If this is done, he is promised that in a short time the natural orders to which most British plants belong will be easily recognised. The little volume closes with instructions for drying plants, an appendix showing how to describe them, and a combined index and glossary. The text is freely illustrated by good woodcuts, most of which, as stated in the preface, were "drawn by Professor Henslow's daughter, Mrs. Barnard, of Cheltenham, from the admirable sheet-diagrams designed by Professor Henslow, and executed by Mr. Fitch for the Committee of Council on Education."

Notes.

Scaling and other Ladders.—Some time ago Mr. George Fawcus presented a set of fire-escape ladders to the corporation of Tynemouth, of which an account appeared in the *Society of Arts Journal*.* He now proposes an improvement on his former plan, by making the rounds of the ladders turned straight, with shoulders to fit against the side pieces, a smaller part going easily into and through the side pieces; he secures the ladders together by five-eight inch or other iron bolts below the top and bottom steps, the ends of these bolts being squared and fitted into plates let neatly into the side pieces, the end beyond the side pieces being screwed, and neat screw-nuts fitted on; the outer sides of the top and inner sides of the bottoms of the side pieces are plated with iron plates that fit over the iron bars. In the centre of these bars there are open eyes either for fixing a rope tackling, or an eyebolt fits round the open eye and the top step of the ladder; the upper end of this eyebolt is swelled into a bulb-ended bolt, which fits into the open eye in the middle of the bar below the bottom step of the next ladder. When a number of these ladders are put together, two small eccentric discs or round plates are fitted on the back and front of the bulb-ended bolts; these fall and act like buttons, to prevent the bulb falling out of the socket either way. This stay thus dovetailing into the socket, the plates behind the screw-nuts, on the ends of the upper bars, form steps or cleets for the feet of succeeding ladders to rest upon.

The Calabar Bean and its Properties.—One of the witnesses who gave evidence at an inquest held not long since on a boy who was poisoned by eating Calabar beans, at Liverpool, has received a letter from a gentleman who has been a missionary in Calabar, describing the properties of the Calabar bean. The writer says:—"The Calabar bean, as an ordeal, is given in various quantities from below a dozen to over a hundred; but a very small portion, less than half, of a bean is sufficient to destroy life; while, on the other hand, entire dozens of the bean have been taken with impunity, being quickly rejected by the stomach and bowels. One bean halved between a brace of infatuated duellists has cut both off; and a woman who was tried for witchcraft some years ago, and who must have taken some dozens in the process, was still living and in vigorous health last year. When used by duellists, it is customary for the challenger to bite a bean in two, consume his half, and hand the other to his opponent, who is obliged to eat it up. This is said to be a common thing among the Ibebios. When it is administered in public trial, the accused is compelled to eat up a few beans just as you see them, while others were being pounded to pulp in his presence. This is afterwards well mixed with water, and one part of the mixture given as a drink, and the other administered in the form of an enema. If the poison so irritates the stomach and bowels as to be completely ejected, which is often the case, the party escapes, and is pronounced innocent; if not he dies, and is therefore guilty. The plant grows to a large size, one plant climbing sometimes over several trees, and almost entirely enveloping them in its foliage. It is often to be met with on the banks of the Calabar river. The flower is not unlike that of the sweet pea. The botanical characters have been described by Professor Balfour, of Edinburgh; while the powers of the bean have been to some extent tested by Dr. Fraser, of the Edinburgh University."

Telegraphic Messages.—A reduction has been made in the cost of telegrams in Paris. A message can now be sent to any part of Paris for fifty centimes, and the administration guarantees that it shall be delivered within half-an-hour from the time it is dispatched.

* Vol. xii., p. 327.

LOSS OF LIFE IN COAL MINES.—By the Inspector's Report for the last year it appears that in that period there were no less than 757 fatal accidents, resulting in the loss of 907 persons in the coal mines of Great Britain.

MINING SCHOOL.—The *Mining and Smelting Magazine* states that the proposition for a Glasgow School of Mines is abandoned, the anticipated subscriptions from coal and iron masters not having been forthcoming.

Patents.

From Commissioners of Patents Journal, September 9th.

GRANTS OF PROVISIONAL PROTECTION.

Aerostatic machine—2030—R. A. Brooman.
Alimentary substances, preservation of—2043—P. A. L. de Fontainemoreau.
Artificial leather, manufacture of—2095—R. Beard, jun., and W. Downing.
Axles and axle-boxes, construction of—2054—F. Swift.
Bedsteads, construction of—2117—E. John.
Bonnets, &c., thread for the manufacture of fabrics and ornaments for—2124—R. A. Brooman.
Boots and shoes, knife for cutting the clamps of—2002—P. Lang.
Buildings, shop-fronts, &c., apparatus for washing, &c.—2138—W. C. S. Percy.
Carriage springs, apparatus for forging—1762—W. Cary.
Carriage windows—2112—R. Marshall.
Cast steel, manufacture of—2031—R. A. Brooman.
Cattle, troughs, racks, and enclosures for—2136—A. E. Peirce.
Chimney pieces—2016—H. C. Tucker.
Churns—2008—G. Haseltine.
Clipper mowing machine—1998—A. B. Childs.
Clothes, &c., apparatus for receiving or holding—2103—A. Newton.
Conservatories, hot water apparatus for heating—2000—J. Milbank.
Cotton, &c., presses for pressing—2022—J. Hodgart.
Cotton, opening, cleaning, and ginning—2034—W. Hoehl, C. Brakell, and W. Gunther.
Cotton seed, cleansing and treatment of—1996—R. D. Edwards.
Dyeing, &c., manufacture of colours for—2060—H. Parkes.
Eggs, preservation of—2026—R. T. Monteith.
Electricity, batteries for generating—2063—J. Thomsen.
Embankments, &c., caissons employed in constructing—2142—G. Furness and L. G. Moore.
Fabrics, machinery for tentering or stretching and drying—2111—H. Jackson.
Fibrous materials, preparing, &c.—2114—E. Calvert and T. Edmeston.
Fibrous materials, self-acting mules for spinning—2119—J. Cheetham.
Fibrous substances, bleaching of—2097—H. Potter.
Fibrous substances, covering rollers for preparing, &c.—2109—W. Allen and W. Johnson.
Fire-arms, breech-loading—2048—T. Wilson.
Fire-arms, locks for—2013—J. P. Lindsay.
Fire-arms, patched balls for—2014—M. Peck.
Floating docks—2118—J. Campbell.
Fuel, manufacture of compressed—2056—J. Grantham.
Garments, manufacture and ornamentation of—1594—B. Nicoll.
Gas, admission, exclusion, and regulation of—2058—C. E. Albrecht.
Gas burners—2092—R. Pilkington.
Gases, regulating the pressure and supply of—2044—W. Dalziel.
Grave monuments—2115—J. Niven.
Guns—2024—W. H. Cox.
Hair pins—2125—R. A. Brooman.
Hand-drilling apparatus—2042—G. Hodgson.
Hemp, &c., treatment of waste from—1839—R. A. Brooman.
Houses, &c., preventing damp, insects, and vermin from entering—2068—F. Feichtinger.
Human excrement, receiving, drying, and deodorising—2072—F. Taylor.
Hydraulic pumps, &c., stop-cocks, taps, or valves employed in—2089—E. Taylor and W. J. Dorning.
Iron and steel, manufacture of—2104—R. Hill.
Iron, coating with steel—2126—J. Lones.
Jute, &c., preparation of—2093—H. L. Kolzewsky, R. Hart, and J. F. Calder.
Lace machinery, bobbin carriages used in—2098—W. Cope.
Lace machinery, manufacture of fabric in—2066—J. Hartshorn and W. Redgate.
Looms—2071—C. W. Harrison.
Looms—2133—C. W. Harrison.
Machinery, disconnecting apparatus for stopping—2140—A. F. Fontaine.
Metallic nuts, manufacture of—2057—E. H. Waldenstrom.
Minerals, machinery for cutting—2121—F. W. Armitage.
Mines, lighting and firing charges in—2100—R. A. Brooman.
Missiles, discharging and exploding under water—1869—A. Alexander.
Paper, applying water marks in—2037—W. Dove.
Paper, &c., manufacture of—2106—H. Hathaway and W. Todd.
Passengers, &c., apparatus for landing—2087—H. Greaves.
Photographic pictures, apparatus employed in taking—2122—R. W. Thomas.
Railway carriages, signalling between passengers and guard, &c.—2038—W. Milligan.
Railway carriages, transferring from one line of rails to another—2102—G. H. and H. R. Cottam.
Railways, communication between passengers and guard—2134—G. Witson.
Railway signals—2141—Sir J. Macneill.
Railway trains, apparatus for retarding and stopping—2094—J. Matthews.
Railway trains, communication between passengers and guard—2049—W. Clark.
Railway trains, communication of passengers from carriage to carriage—2052—C. Cotton.
Railway trains, communication between passengers and guard—2053—W. Thomas.
Railway trains, communication between passengers and guard—2078—T. H. Cleveland.
Sails, reefing and furling—2120—W. Rowden.
Sewing machinery—2040—A. V. Newton.
Sewing machines—2010—G. Davies.
Ships, combination of steam and air as a motive power to—2139—J. B. Andreux and E. Coulon.
Ships, &c., sheathing and protection of—2131—H. H. Henson.
Ships, propulsion of—2065—J. G. White.
Ships, sheathing and coating the bottoms of—2096—T. J. Hughes.
Ships, signalling apparatus on board of—2123—R. A. Brooman.
Silk floss, production of—2032—S. and C. Collins.
Spinning machinery—2074—B. W. Barwick and W. Hartley.
Stoves, portable—1936—W. Prockter.
Submarine shells—2064—G. Davies.
Telegraph cables, machinery for winding, &c.—2080—R. A. Brooman.
Tubular and hollow articles, manufacture of—2046—G. Coles, J. A. Jaques, and J. A. Fanshawe.
Watches—2107—M. L. Muller.
Water, apparatus for purifying—2018—E. Andries.
Water-closets—2129—J. Shanks.
Water-closets, &c., supply of water to—2061—F. G. Underhay and R. Heyworth, jun.
Water, raising and discharging—2086—W. Spence.
Wood, machinery for planing—2110—E. Hunt.
Wrenches—2077—R. M. Black.
Yarns, &c., apparatus for washing and cleansing—2012—M. Brown.

PATENTS SEALED.

571. W. E. Gedge.
575. J. Symes.
585. D. Brodie.
587. C. Brakell.
588. F. Spiers and C. Pond.
592. E. Bishop and W. Bailey.
594. N. Thompson.
595. J. L. Norton.
596. W. E. Broderick and W. Rees.
597. J. T. Way.
598. G. T. Bousfield.
601. J. H. Schofield.
612. F. Walton.
613. W. Wilson.
617. C. J. Sharp.
619. W. T. W. Jones.
621. H. Simester and J. Bainbridge.
623. J. Crompton.
624. C. E. Wallis.
629. L. A. Durrieu.
631. A. Smith.
634. J. Platt and W. Richardson.
635. R. Fletcher.
639. T. Parkinson, F. Taylor, and T. Burton.
642. H. Eastwood and B. Matthews.
644. S. Holmes.
645. W. E. Gedge.
646. J. Platt and G. Little.
648. W. Hensman.
649. C. R. Broadbridge.
652. T. Chamberlayne.
654. T. P. Tregaskis.
655. J. Empson & H. von Hartz.
659. A. H. Martin.
661. E. F. Ruffin.
662. J. Rowell.
668. J. Carrick.
672. H. Bateman.
685. J. Bleasdale.
692. J. Genevrier & P. E. Bidaux.
693. F. Dancart.
709. A. B. Childs.
756. W. Clark.
761. M. Clough.
784. H. Smith and E. Roberts.
807. E. Stott.

From Commissioners of Patents Journal, September 13th.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2295. H. C. Jennings.
2241. J. Holland and G. Okell.
2253. R. A. Brooman.
2325. W. Cory, jun.
2385. J. Cottrill.
2265. C. Greaves.
2285. G. Dixon.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2350. E. Lavender.
2363. W. Crofts.
2391. G. B. Bensen.
2513. E. Thompson and W. J. Nicholson.
2367. J. Mills.
2371. C. Lungley.
2382. W. Jenkins.

Registered Designs.

Geometric joint for walking and umbrella sticks—4655—D. Elkan, 1, Copley-terrace, Wenlock-street, and 15, Arlington-street, New North-road.
Lantern or lamp case—4656—A. Leslie, Tarriff, Aberdeenshire.
False or show slides—4657—G. Burton, 3, St. John's-st., Clerkenwell.

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THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, SEPTEMBER 23, 1864. [No. 618. Vol. XII.

TABLE OF CONTENTS.

Proceedings of the Society.

EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Continued from page* 690.)

FRENCH.

THREE HOURS ALLOWED.

Part I.

Candidates for a Third-class Certificate are to translate the following extract into English, and to answer the grammatical questions thereto annexed (in the order in which they are placed). This first part is all that will be required of them.

Fénelon, dans les sages conseils qu'il donnait à Jacques III., montrait sa haute estime pour la constitution anglaise, si forte à la fois contre le despotisme et contre l'anarchie. Il était exempt de cet étroit patriotisme qui calomnie tout ce qui existe au-delà des frontières. Son âme vertueuse avait besoin de s'étendre dans l'univers, et d'y chercher le bonheur des hommes. "J'aime mieux," disait-il, "ma famille que moi-même; j'aime mieux ma patrie que ma famille; mais j'aime encore mieux le genre humain que ma patrie." Admirable progression de sentiments et de devoirs! Des esprits faux et pervers ont abusé de ce principe; il méritait cependant d'être autorisé par Fénelon; c'est le *caritas generis humani* échappé de l'âme de Cicéron, mais démenti par les féroces conquêtes des Romains. . . . . Le christianisme était digne de consacrer, par la bouche de Fénelon, une maxime que la nature a mise dans le cœur de l'homme. Quand cette vérité triomphera, nous croirons au progrès des lumières! Après tous ces cris patriotiques, qui ne sont trop souvent que les devises de l'égoïsme, les prétextes de l'ambition et les signaux de la guerre, ne criera-t-on jamais en posant les armes et par un vœu qu'il est temps d'accomplir: *Vive le genre humain!* L'humanité de Fénelon ne se bornait pas à des spéculations exagérées, à des généralités impraticables, qui supposent l'ignorance du détail des affaires humaines. Sa politique n'était pas seulement le rêve d'une âme vertueuse. Il avait vu, il avait jugé la cour et les hommes; il connaissait l'histoire de tous les siècles, il était doué d'une certaine indépendance d'esprit qui le mettait au-dessus des préjugés d'état et de nation.

Villemain.

1. Parse the first three sentences of the above extract.
2. Write the five primitive tenses of all the verbs contained above, each verb to be given in a separate line.
3. Give the noun that corresponds to each of these adjectives:—*Sages, haute, forte, exempt, étroit, vertueuse, humain, faux, pervers, féroces, dignes, patriotiques, exagérées.*
4. Give the adjective that corresponds to each of these nouns:—*Conseils, constitution, despotisme, univers, bonheur, famille, cœur, vérité, progrès, égoïsme, ambition, guerre, détail, affaires, rêve, esprit, nation.*
5. Explain *cet, son,* and *t*, in:—"*cet* étroit patriotisme;" "*son* âme vertueuse;" ne criera-*t*-on jamais."
6. Explain the past participle in:—"Une maxime que la nature a *mise*."
7. Show, by means of the article and a suitable epithet, the gender of each of the following nouns:—*Précipice, escompte, malaise, insignes, carrosse, vertige, cloaque, monticule, manége, écritoire.*
8. Write fully: 200 *chevaux, chapitre* 80, 220 *personnes, page* 300, 385 *volumes, l'an* 1200.
9. Translate:—*You trod on my toes; you trod on my dress.* The rendering of these sentences in French must not be the same. Explain the difference.
10. Give with examples the rule which refers to the agreement of the adjectives *nu* and *demi*.
11. When is the preposition *by* expressed by *de*, instead of *par*, after a passive verb?
12. Explain the difference of meaning between *il s'est blessé* and *il s'est blessé lui-même.*
13. Translate:—*They will hurt one another*, (1) in speaking of two only; (2) in speaking of more than two; and also, *They will fight against each other*, taking care to put the preposition in its right place in French.
14. Conjugate the preterit, the imperative, and present subjunctive, of *s'en aller, mourir, venir, savoir, faire,* and *vivre.*

Part II.

Candidates for a Second-class Certificate are to answer the next four grammatical questions, and to translate the English extract and idiomatic expressions which follow:—

I.—Grammar.

1. When is *which* to be rendered by "ce qui" or "ce que," instead of simply by "qui" or "que?" Examples.
2. Show by examples how closely the logical connection of the different words in a sentence must be adhered to in French.
3. Explain *le* in the following cases:—"C'est comme je vous *le* dis;" "Il en sera comme vous *le* désirez;" "C'est meilleur que vous ne *le* pensez;" "Il est jeune, du moins il *le* paraît;" "Etes-vous son frère? Je *le* suis."
4. When should *its* and *theirs* be rendered by the personal pronoun *en* and the definite article, and not by the possessive pronouns *son, sa, ses, leur, leurs?*

II.—Translation.

"If time be of all things the most precious, wasting

time must be (as poor Richard says), the greatest prodigality;" since, as he elsewhere tells us, "lost time is never found again; and what we call time enough, always proves little enough." Let us, then, up and be doing, and doing to the purpose; so by diligence shall we do more with less perplexity. Sloth makes all things difficult, but industry all easy, as poor Richard says, and "He that riseth late must trot all day, and shall scarce overtake his business at night; while laziness travels so slowly that poverty soon overtakes him," as we read in poor Richard, who adds, "Drive thy business, let not that drive thee;" and, "Early to bed and early to rise, makes a man healthy, wealthy, and wise."

If we are industrious, we shall never starve; for, as poor Richard says, "At the working-man's house hunger looks in, but dares not enter." Nor will the bailiff or the constable enter; for, "Industry pays debts, but despair increaseth them," says poor Richard. What though you have found no treasure, nor has any rich relation left you a legacy, "Diligence is the mother of good luck," as poor Richard says, and "God gives all things to industry. Then plough deep while sluggards sleep, and you will have corn to sell and to keep," says poor Dick. Work while it is called to-day; for you know not how much you may be hindered to-morrow, which makes poor Richard say, "One to-day is worth two to-morrows;" and, further, "Never leave that till to-morrow which you can do to-day." Benjamin Franklin.

III.—Idioms.

J'y perds mon latin.
C'est un panier percé.
J'ai eu maille à partir avec lui.
Ils ont eu vent de la chose.
Il ne se le laissera pas dire deux fois.
Les maladies viennent à cheval et s'en retournent à pied.
Aux grands portaux battent les grands vents.
Les oreilles ont dû vous corner.
Quoi qu'il arrive, ne jetez jamais le manche après la cognée.
Autant en emporte le vent.

Part III.

Candidates aiming at a first-class certificate are expected to translate the above idiomatic expressions and English extracts, and to answer in French the following questions:—

Literature.—1. What are the principal works of Bossuet, Boileau, and Racine?

2. Sketch the life of Fénelon.

3. Explain the spirit that pervades the writings of the great classical authors, from Molière to Fénelon, and trace it back to its source.

History.—Relate the circumstances attending the Revocation of the Edict of Nantes; and show its disastrous results.

GERMAN.

THREE HOURS ALLOWED.

Each candidate is expected to translate one of the following passages, to answer some of the grammatical questions, and turn into German several of the sentences and pieces given for this purpose. Candidates for a first class must translate one piece of Section I., (e) (f) and (g), of Section II., and 19—22 inclusive of Section III., and write the essay:—

Section I.

Viglius von Zuichem von Aytta, President des geheimen Raths, Staatsrath und Siegelbewahrer, galt jetzt für den wichtigsten Mann im Senate und die mächtigste Stütze der Krone und der Tiare. Dieser verdienstvolle Greis, dem wir einige schätzbare Beiträge zu der Geschichte des niederländischen Aufruhrs verdanken, und dessen vertrauter Briefwechsel mit seinen Freunden uns in Erzählung derselben mehrmals geleitet hat, war einer der grössten Rechtsgelehrten seiner Zeit, dabei noch Theolog und Priester, und hatte schon unter dem Kaiser die wichtigsten Aemter bekleidet. Der Umgang mit den gelehrtesten Männern, welche jenes Zeitalter zierten, und an deren Spitze sich Erasmus von Rotterdam befand, mit öftern Reisen verbunden, die er in Geschäften des Kaisers anstellte, hatten den Kreis seiner Kenntnisse und Erfahrungen erweitert und seine Grundsätze in manchen Stücken über seine Zeiten erhoben. Der Ruhm seiner Gelehrsamkeit erfüllte sein ganzes Jahrhundert und hat seinen Namen zur Nachwelt getragen.

2. Dies Eine nur vernimm! Du zitterst jetzt
Vor dieser lebenden Maria. Nicht
Die lebende hast du zu fürchten. Zittre vor
Der Todten, der Enthaupteten. Sie wird
Vom Grab' erstehen, eine Zwietrachtsgöttin,
Ein Rachegeist in deinem Reich herumgehn
Und deines Volkes Herzen von dir wenden.
Jetzt hasst der Britte die Gefürchtete;
Er wird sie rächen, wenn sie nicht mehr ist.
Nicht mehr die Feindin seines Glaubens, nur
Die Enkeltochter seiner Könige,
Des Hasses Opfer und der Eifersucht,
Wird er in der Bejammerten erblicken!
Schnell wirst du die Veränderung erfahren.
Durchziehe London, wenn die blut'ge That
Geschehen, zeige dich dem Volk, das sonst
Sich jubelnd um dich her ergoss, du wirst
Ein andres England sehn, ein andres Volk.

3. Wie leicht der Jüngling schwere Lasten trägt,
Und Fehler wie den Staub vom Kleide schüttelt!
Es wäre zu verwundern, wenn die Zauberkraft
Der Dichtung nicht bekannter wäre, die
Mit dem Unmöglichen so gern ihr Spiel
Zu treiben liebt. Ob du auch so, mein Fürst,
Ob alle deine Diener diese That
So unbedeutend halten, zweifl' ich fast.
Die Majestät verbreitet ihren Schutz
Auf jeden, der sich ihr, wie einer Gottheit
Und ihrer unverletzten Wohnung naht.
Wie an dem Fusse des Altars, bezähmt
Sich auf der Schwelle jede Leidenschaft.
Da blinkt kein Schwert, da fällt kein drohend Wort,
Da fordert selbst Beleid'gung keine Rache.
Es bleibt das weite Feld ein offner Raum
Für Grimm und Unversöhnlichkeit genug.
Dort wird kein Feiger drohn, kein Mann wird fliehn.

4. Prinz Franz Eugen stammte aus einer Seitenlinie des Savoyschen Hauses her und war in seiner Jugend zum geistlichen Stande bestimmt; aber sein Geist zog ihn zu der Betrachtung der Geschichte und in den raschen Strom des thätigen Lebens. Als zwanzigjähriger Jüngling bot er seine Dienste dem König Ludwig an; dieser, der ihn wegen seiner Kleinheit nicht der Beachtung werth fand, wies ihn ab und rieth ihm, im geistlichen Stande zu bleiben. Eugen wandte sich nach Oestreich, wo der Türkenkrieg ihm eine Bahn zu öffnen schien, und zeichnete sich bald so sehr aus, dass der Kaiser ihm nach der Befreiung von Wien im Jahre 1683, wobei er tapfer mitgefochten hatte, ein Reiterregiment verlieh. Der Herzog Karl von Lothringen erkannte schon damals den Helden in ihm. Leopold ernannte ihn im Jahre 1693 zum Feldmarschall, und nun hätte ihn der König Ludwig gern wieder für sich gewonnen; er liess ihm die Statthalterschaft von Champagne und die Würde eines Marschalls von Frankreich anbieten; aber Eugen antwortete dem Abgeordneten: "Sagen Sie Ihrem Könige, dass ich kaiserlicher Feldmarschall bin, welches eben so viel ist als der französische Marshallstab."

Section II.—Grammar and Idioms.

(a.) Decline the personal pronouns er, sie, es.

(b.) State the comparative and superlative of gern, bald, nahe, hoch, and wohl.

(c.) When must the pronouns der, dieser, jener, welcher, agree in gender with the substantive, and when do they not? Illustrate the rule by two examples for each pronoun.

(d.) Decline the German of: good king, this beautiful flower, my large book, in every case of the singular and plural.

(e.) State the third person singular, present and imperfect, both in the indicative and subjunctive of:—werfen, gelten, vernehmen, sehen, tragen, anbieten, abweisen. Add, likewise, the participle past of the preceding verbs.

(f.) When must "to be" in connection with a past participle be expressed by "sein," and when by "werden?" Illustrate the rule by three examples.

(g.) Da geht's ja hoch her.
Da ging's drauf und drein.
Da ist's einmal lustig zugegangen.
Sie haben sich sehr lustig über uns gemacht.
Machen Sie sich's bequem.
Er kehrte sich nicht daran.
Er wollte gar nicht dran gehen, so sehr war's ihm zuwider.
Er schlug um jede Kleinigkeit sein Leben in die Schanze.
Was geht das mich an! Eines schickt sich nun einmal nicht für alle.
Darin hat man es in diesem Jahrhundert viel weiter gebracht.
Das müssen Sie sich aus dem Sinne schlagen.

Section III.

Translate into German ten of the following passages The writing, either in English or German characters, must be very legible.

1. He knew everything except that.
2. I should not have known him.
3. Do come to us soon.
4. At what o'clock did he leave town?
5. They had gone into the country for six weeks.
6. Will you have a glass of wine and a piece of cake?
7. They were playing when we came into the room.
8. Let us take a walk into the garden.
9. He is praised by every one.
10. This is the largest tree I ever saw.
11. What sort of books do you now read?
12. I, who am older than you, give you that advice.
12. He has written his letter best of all.
14. I offered him a large sum, but he did not accept it.
15. The windows have not been opened yet.
16. Not having heard of him during the last fortnight, I made up my mind to depart alone.
17. He saved himself by jumping out of the window.
18. She has become ill by eating too much fruit.
19. There was much playing and dancing at my aunt's last night.
20. We ought to have done it long ago.
21. Would they had been able to come!
22. A man may have lived almost an age and traversed a continent, minutely examining its curiosities, and yet, after having explored many a cavern, he may have left undetected a darker recess in his own character; he may have conversed with many people, in different languages, on numberless subjects, but having neglected those conversations with himself, by which his whole moral being should have been continually disclosed to his view, he is better qualified, perhaps, to describe the intrigues of a foreign court, or the progress of a foreign trader, to represent the manners of the Italians or the Turks, to narrate the proceedings of the Jesuits or the adventures of the gipsies, than to write the history of his own mind.

Write in German a short essay on "The Advantages an Englishman derives from the Study of the German Language."

(To be continued.)

Proceedings of Institutions.

Bradford Mechanics' Institute.—The thirty-second annual report shows that as regards the number of members and financial condition, the Institute is in a very hopeful state. The present number of members is 1,317, showing an increase of 146 upon the previous year. The receipts from subscriptions have been £528 19s. 4d., and from other sources £196 3s. 6d., total £725 2s. 10d., showing an increase of £76 10s. 10d. over the previous year's income. The total expenditure has been £692 19s. 7d., being £60 11s. 8d. more than last year. The balance in hand is increased from £75 0s. 6d. to £107 3s. 9d. During the past year the committee have subscribed to the London Library Company for the loan of 100 volumes, and by this means they have been able to offer the members a larger supply of new works. The issue of the books thus obtained has averaged seventeen or eighteen per day. More money has been expended on the library than in any former year, chiefly on account of a greatly increased outlay being required for binding. The following shows the state of the library up to the 1st April, 1864:—The number of volumes in the library in the previous year was 8,332, which has been increased to 8,500. The total circulation has been 37,189, against 32,438 last year. The circulation of works of fiction was 15,962, against 12,976 last year. Among the lectures delivered were one by Geo. Dawson, Esq., on "Socrates;" one by C. P. Measor, Esq., on the "Extension of the Principles of the Factory Legislation;" one by Mr. Wheeler, on the "History of the Steam Engine; one by Mrs. Balfour, on "Dr. Johnson and his Streatham Friends;" one by S. W. North, Esq., on "Some recent researches into the probable Antiquity of Man;" and one by Geo. Dawson, Esq., on "Sir Thomas More." The attendance was not very satisfactory. Classes in writing and arithmetic, reading (higher and lower) grammar, geography (elementary and physical) English history, mathematics, Latin, French, German, drawing, and chemistry have been in operation. The number of students on the books was 616, with an average attendance of 389. The numbers on the books, as well as those in regular attendance, have been rather greater than in the previous session; but this increase has been chiefly in the elementary classes. The advanced classes only show a slight improvement.

Newcastle-upon-Tyne Mechanics' Institute.—The fortieth annual report says that the Institution has lost none of its efficiency and usefulness, and the various departments are in a satisfactory condition. A thorough revision of the members' roll has been made, and the number is now 1,005, a great portion of them being working men or their sons. 121 volumes of new books have been added to the library during the year, a considerably larger number than on the previous one. The issues during the year have been 12,135. The number of newspapers has been increased since last report. The classes in connection with the Institution have been carried on very successfully. The numbers attending the classes are:—Chemistry, 53; French, 47; Latin, 9; arithmetic and book-keeping, 11; English Grammar, 34; making a total of 154, a considerable increase over last year's attendance. The teacher reports very favourably of the chemistry class, and the results of the Government Science Examination were most satisfactory; of fifty pupils, fourteen gained prizes, and seven received honourable mention. At the Society of Arts Examination there were also several certificates awarded. There have not been so many "Readings" as reported in previous years. If few in number, however, they were eminently successful, both in the attendance of the public and the quality of the entertainment placed before them. The balance from them (including proceeds from soirée held at Christmas) was £11 4s. 8d. One half-yearly examination in oratory, under the "Thompson Bequest," has taken

place since last report, the subject was "The probable effect of the present American War on Slavery," and 1st, 2nd, and 3rd prizes were awarded. In the debating class the attendance has been good. In addition to debates, short readings and recitations have been introduced, having the effect of still more popularizing the class amongst the members generally. The committee regret the loss, by death, of the old and valued friend and treasurer of the Institution, Mr. Robert Wallace. He had held that office since 1846, and down to the time of his decease he took an active part in its management. Mr. Joseph Cowen, jun., has been elected treasurer as his successor. The balance-sheet shows that the expenditure has been £230 1s. 11d., and that there is a balance due to the treasurer of £26 18s. This is the only matter of regret referred to in the report.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—BATH, 1864.

The business of the Sections commenced on Thursday, September 15th, 1864. The following is a list of the Papers read:—

THURSDAY, SEPTEMBER 15th.

Section A.—Mathematical and Physical Science.

J. Glaisher.—Report on Luminous Meteors.

Professor Hennessy.—On the possible Connection between the Ellipticity of Mars and the general Appearance of its Surface.

Rev. T. W. Webb.—On a Suspected Change of Brightness in the lunar spot Werner.

W. R. Birt—On the Importance of adopting Methods for the detection of Change on the Moon's Surface.

Rev. T. Furlong—On the Probability of Constructing Ellipsoidal Lenses.

C. Tomlinson—On the Cohesion Figures of Liquids.

M. Moggridge.—On an Easy Mode of Measuring Heights.

Rev. E. B. Ellman.—On the Earthquake and Storm in Sussex on the 21st of August, 1864.

Section B.—Chemical Science.

Opening Address by the President.

Dr. Gladstone.—Report of the Committee on the application of Gun Cotton to Warlike Purposes.

Dr. Miller.—On the Analysis of a Hot Spring containing Lithium and Cœsium in Wheal Clifford.

Dr. Daubeny.—On the Bath Waters.

Dr. Paul.—Note on some of the Constituents of the Oil known as Crude Paraffin Oil.

Section C.—Geology.

The President's Opening Address.

W. Sanders.—A brief Explanation of a Geological Map of the neighbourhood of Bristol and Bath.

Professor Phillips.—Measures of Geological Time by Natural Chronometers, with a communication from M. Morlet.

H. C. Sorby.—On the conclusion to be deduced from the Physical Structure of some Meteorites.

H. Woodward.—On the family Eurypteridæ, with description of some new genera and species.

H. C. Salmon.—On the Geognostic relations of the Auriferous Quartz of Nova Scotia.

F. Von Hauer.—A Notice of the latest Labours of the Imperial Geological Institute of the Austrian Empire.

Sir R. I. Murchison.—Note on the occurrence of the same Fossil Plants in the Permian Rocks of Westmoreland and Durham.

W. Pengelly.—On Changes of Relative Level of Land and Sea in south-western Devonshire, in connection with the Antiquity of Mankind.

Section D.—Zoology and Botany.

The President.—Inaugural Address.

T. Spencer Cobbold, M.D., F.R.S.—Report of Experiments respecting the Development and Migration of the Entozoa.

J. Gwyn Jeffreys, F.R.S.—Further Report on Shetland Dredging.

J. Gwyn Jeffreys, F.R.S.—Remarks on *Stylifer*, a genus of quasi-parasitic Mollusca, with particulars of the European species *S. Turtoni.*

Francis Galton, F.R.S.—First steps towards the Domestication of Animals.

Sub-Section D.—Physiology.

President's Address.—On the Present State of the Dietary Question.

Rev. J. Slatter.—On the Dietary of the Agricultural Poor.

G. D. Gibb, M.D.—On the Various Forms assumed by the Glottis.

W. Turner, M.B.—On a Supplementary System of Nutrient Arteries for the Lungs.

W. E. C. Nourse.—On the Action of the Nervous Tissue concerned in Perception.

Section E.—Geography and Ethnology.

The President's Address.

Rev. H. B. Tristram.—On the Physical and Political Geography of the Jordan Valley and Eastern Palestine.

Rev. G. Clowes.—On the Western Shores of the Dead Sea.

Alexander Michie.—Notes on China, Mongolia, and Siberia.

M. Vambery.—On the Turcoman Tribes of Central Asia.

M. Nicolas de Khanikof.—On the Ethnology of the Iranian Race.

M. Alexander Hippius.—Russian Trade with Bokhara.

Section F.—Economic Science and Statistics.

The President's Address.

The Recorder of Bath.—Statistics of Crime and Criminals.

Professor Levi.—Statistics of the Number and Occupations of Foreigners in England.

Section G.—Mechanical Science.

The President's Address.

James Oldham.—Report of the Committee on Tidal Observations on the Humber, the Trent, and the Yorkshire Ouse.

Wm. Fairbairn, LL.D., F.R.S.—On the Mechanical Properties of the Atlantic Telegraph Cable.

Admiral Sir Edward Belcher, communicated by Capt. Doty, of the Confederate States.—On Torpedoes used by the Confederate States in the Destruction of some of the Federal Vessels of War, and the Mode of attaching them to the Rams.

Capt. Wheatley, R.N.—On Revolving Sails.

Capt. Wheatley, R.N.—On Plated Ships and their Armament.

In the evening a conversazione took place in the Assembly Rooms.

FRIDAY, SEPTEMBER 16th, 1864.

Section A.—Mathematical and Physical Science.

Dr. Gladstone.—Report of Committee on Fog Signals.

Dr. Gladstone.—On the Transmission of the Red Ray by many-coloured Solutions.

C. Cator.—On a new Anemometer.

Professor Rankine.—On the Properties of certain Stream-lines.

W. H. L. Russell.—On Symbolical Expansions.

Professor Cayley.—On a Formula of M. Chasles relating to the Contact of Conics.

Professor Cayley.—On the Problem of the in-and-circumscribed Triangle.

T. A. Hirst.—On the Generalisation of the method of Geometrical Inversion.

A. J. Ellis.—On Stigmatics.

Dr. Stevelly.—On a Mode of Determining the Velocity of Sound.

Professor Phillips.—Notice of the Physical Aspect of the Sun.

SECTION B.—CHEMICAL SCIENCE.

Rev. G. F. Browne.—On the Prismatic Formation of Ice.

A. R. Catton.—On the direct Conversion of Acetic Acid into Butyric and Caproic Acids.

Dr. W. Bird Herapath.—On a new method of Discovering the Hydrogen Compounds of Arsenic, Sulphur, Antimony, and Phosphorus, when in company as a mixed gas.

Dr. T. Anderson.—On some Bituminous Substances.

Stewart Clark.—Description of an Apparatus for Estimating the Organic Impurities in Atmospheric Air and in Water.

Dr. Stevenson Macadam.—On the Pollution of Rivers by the Sewage of Towns.

Dr. Henry Bird.—On the Utilisation of Sewage.

SECTION C.—GEOLOGY.

C. Moore.—Remarks on the Geology of the South-West of England.

H. B. Brady.—On the Foraminifera of the Middle and Upper Lias of Somersetshire.

Professor Harkness.—On the Lower Silurian Rocks of the South-East of Cumberland and the North-East of Westmoreland.

Rev. G. F. Browne.—On the Formation and Condition of Ice in certain Ice Caves of the Jura, Vosgian Jura, Dauphiné, and Savoy.

W. W. Stoddart.—On the Lowest Beds of the Clifton Carboniferous Series.

Handel Cossham.—On the Geological Formation of the district around Kingswood Hill, with especial reference to supposed Development of Millstone Grit in that neighbourhood.

SECTION D.—ZOOLOGY AND BOTANY.

Dr. Edward Crisp.—Contributions to the Anatomy of the Quadrumana, with a comparative estimate of the Intelligence of the Apes and Monkeys.

Dr. G. D. Gibb.—Special Differences between the Larynx of the Negro and that of the White Man.

Rev. H. B. Tristram, F.L.S.—On the Ornithology of Palestine, and the Peculiarities of the Jordan Valley.

Dr. Scott.—On the *Turdus torquatus* as observed in Devonshire.

Dr. Herapath, F.R.S.—On the genus *Synopta*.

SUB-SECTION D.—PHYSIOLOGY.

M. Foster, M.D.—Report on Muscular Irritability.

R. Boyd, M.D.—Observations on the Measurements of the Head and Weight of the Brain in 696 Cases of Insanity.

W. Turner, M.B.—On Cranial Deformities. Trigonocephalus.

J. Thurnam, M.D.—On the Obliteration of the Sutures in one class of Ancient British Skulls.

W. B. Herapath, M.D.—On the presence of Indigo in Purulent Discharges.

John Davy, M.D.—On the Temperature of the Sexes.

T. S. Prideaux.—On the Functions of the Cerebellum.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

Capt. R. F. Burton.—Ethnology of Dahomey.

John Petherick.—Latest News from Mr. S. Baker, the Traveller in Central Africa.

James Fox Wilson.—Increasing Desiccation of Inner Southern Africa.

Dr. Thomas Hodgkin.—Growth of Desert in Morocco.

John Crawfurd.—On the Early Migrations of Man.

R. Stuart Poole.—On the Ethnic Relations of the Egyptian Race.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

James Heywood.—Report of a Committee of the British Association, on Uniformity of Weights and Measures. (A Deputation from the Chemical Section attended on the presentation of this Report.)

Col. Torrens.—On the System of Land-transfer in Australia.

Samuel Brown.—On the Mortality of Europeans in India.

Edward Spender.—On the "Truck-system" in some parts of the West of England.

W. Chetwynd.—On the Progress of Postal Banks (Post Office Savings Banks).

SECTION G.—MECHANICAL SCIENCE.

Professor Rankine, F.R.S.—Report of the Committee for experimenting on the resistance of bodies moving under water, as compared with that of bodies floating on the surface.

T. Webster, F.R.S.—Report of the Committee on the Patent Laws.

Peter W. Barlow, C.E., F.R.S.—On the Power required to overcome the Vis Inertiæ of Railway Trains, with description of Machine to propel Trains between Stations without Locomotives.

Captain Selwyn, R.N.—On Submarine Telegraphy.

W. Symons.—On the Working of Underground Railways by means of Hydraulic Power.

In the evening Professor Roscoe delivered a discourse "On the Chemical Action of Light."

SATURDAY, SEPTEMBER 17TH.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

J. B. Thompson.—On the Mechanical Theory and Application of the Laws of Magnetic Induction and Electricity.

H. Keevil.—On the Development of Electricity from the Rays of the Sun and other Sources of Light.

J. G. Symons.—On the Fall of Rain in the British Isles.

Rev. L. Jenyns.—On the Temperature and Rainfall of Bath.

A. Catton.—On the Rhombohedral System in Crystallography.

R. A. Peacock.—On a New Formula for Calculating the Initial Pressure of Steam.

A. Catton.—On the Connection between the Form and Optical Properties of Crystals.

SECTION B.—CHEMICAL SCIENCE.

(On account of the Excursion, this Section did not meet on Saturday.)

SECTION C.—GEOLOGY.

W. H. Baily.—On the Occurrence of Fish Remains in the Old Red Sandstone of Portishead, near Bristol.

Rev. P. B. Brodie.—Remarks on two Outliers of Lias in South Warwickshire, and on the presence of the Lias or Rhœtic Bone-bed at Knowle, its furthest northern extension hitherto recognised.

C. W. Peach.—On Traces of Glacial Drifts in the Shetland Islands.

C. W. Peach.—On Boulder Clay Fossils.

J. Leckenby.—On the Boulder Clay and Drifts of Scarborough and East Yorkshire.

Dr. Daubeny.—On the Cause of the Extrication of Carbonic Acid from the Interior of the Earth, and on its Chemical Action upon the constituents of Felspathic Rocks.

Commander B. Pim, R.N.—Notes on the Volcanic Phenomena and Mineral and Thermal Waters of Nicaragua.

J. W. Salter.—On the old Pre-Cambrian (Laurentian) Island of St. David's, Pembrokeshire.

J. W. Salter.—On some New Forms of Olenoid Trilobites from the lowest Fossiliferous Rocks of Wales.

W. H. Baily.—On some New Points in the Structure of *Palæchinus.*

Section D.—Zoology and Botany.

(This Section did not meet on Saturday owing to Excursions.)

Sub-Section D.—Physiology.

The President.—On the Combination of Food in the Meals of the Labouring Classes.

B. W. Richardson, M.D.—On the Inhalation of Oxygen Gas.

G. D. Gibb, M.D.—Note on the Action of the Bromides of Lithium and Zinc.

R. Garner, F.L.S.—On a Vocal Organ of an Aquatic Insect.

John Goodman, M.D.—The Functions of the Liver.

L. T. A. Carter, M.D.—On the Lymphatics in the Liver of Man and the Pig.

E. Crisp, M.D.—On the presence of Valves in the Abdominal Veins.

Section E.—Geography and Ethnology.

Viscount Milton and Dr. Cheadle.—An Expedition across the Rocky Mountains into British Columbia, by the Yellow Head or Leather Pass.

Richard Spruce.—On the Physical Geography of the Peruvian Coast Valleys of Chira and Piura, and the adjacent Deserts.

Richard Spruce.—On the River Purus, a great affluent of the Amazons.

H. W. Bates.—On the Formation of the Delta of the Amazons.

Kenneth Maclea.—A remarkable Storm and Beach Wave at St. Shotts, Newfoundland.

John Crawfurd.—On the supposed Stone, Bronze, and Iron Ages of Society.

Dr. Henry Bird.—An account of the Human Bones found in Tumuli, situated in the Cotteswold Hills.

Section F.—Economic Science and Statistics.

A. B. Middleton.—Sanitary Statistics of Salisbury.

Dr. J. A. Symonds.—Sanitary Statistics of Clifton.

R. T. Gore.—On the Mortality of the City of Bath.

Section G.—Mechanical Science.

(This Section did not meet on Saturday owing to Excursions.)

MONDAY, SEPTEMBER 19th.

Section A.—Mathematical and Physical Science.

Col. Sykes.—Report of the Balloon Committee.

J. Glaisher.—Account of Balloon Ascents.

T. A. Hirst.—On a Transformation of Plane Curves recently proposed by Professor Cremona.

A. Claudet.—On Photosculpture.

W. Huggins and Dr. Miller.—On the Spectra of some of the Heavenly Bodies.

Fleeming Jenkin.—On the Retardation of Electrical Signals on Land Lines.

Dr. Lee.—On an extensive lunar Plain near the Montes Hercynii, which it is proposed to name Otto Struve.

J. J. Walker.—On two of the Conditions of the Resolvability of a Ternary Cubic Form into Linear Factors.

G. Griffith.—Report of Committee on the Transmutation of Spectral Rays.

Fleeming Jenkin.—Interim Report on Thermo-Electric Phenomena.

Section B.—Chemical Science.

W. Poole King.—On the Premature Decay of the Frescoes in the Houses of Parliament, its Cause, and Remedy.

Maxwell Lyte.—On an apparatus for the preservation or disengagement of sulphuretted hydrogen, carbonic acid, or other gases.

Dr. Phipson.—On the Black Stones which fell from the Atmosphere at Birmingham.

F. Crace Calvert, F.R.S., F.C.S.—On a new method of extracting Gold from Auriferous Ores.

Dr. Phipson.—On the Medicinal Muds of the Island of Ischia.

Professor Tennant.—On the Colouring of Agates.

Alphonse Gages.—On the Artificial Production of Anhydrite.

Fredk. Field.—On a Specimen of Tin Ore hitherto undescribed.

P. Spence.—On Copper Smelting.

Dr. Machattie.—On the presence of Nickel in Metallic Lead.

Dr. Machattie.—A Suggestion on the Detection of Poisons by Dialysis.

Dr. Sullivan.—On the Precipitation of Aluminous Silicates from Solution.

Professor Wanklyn.—On the Rational Formula of Rosaniline.

Professor Wanklyn.—On the Composition of certain Organic Dyes.

A. R. Catton.—On the Molecular Constitution of Carbon Compounds.

Section C.—Geology.

Rev. H. B. Tristram.—On a Bone-breccia with Flints found in the Lebanon.

Rev. H. B. Tristram.—On the Formation of the Jordan Valley and the Dead Sea.

Rev. H. B. Tristram.—Notice of a Bitumen and Sulphur Deposit at the South-west corner of the Dead Sea.

Rev. H. B. Tristram.—On the Geology of Palestine.

Dr. Hector.—On the Geology of Otago, New Zealand.

W. Keene.—On the Coal Measures of New South Wales.

J. Mackenzie.—On the New South Wales Coal Field.

J. Randall.—On the Position in the Great Oolite, and the Mode of Working, of the Bath Freestone.

H. Seeley.—On the Significance of the Sequence of Rocks and Fossils.

E. R. Lankester.—On the Species of the Genus *Pteraspis.*

Dr. T. Wright.—On the White Lias of Dorsetshire.

Section D.—Zoology and Botany.

E. Ray Lankester.—On certain points in the anatomy of the Earth Worm.

W. A. Sanford.—Notice of a New British Rhizopod and some other marine animals.

Dr. Daubeny.—On the Decay of Species, and the Natural Provision for extending their Duration.

Frank Buckland.—On the Natural History of the Oyster.

John Davy, M.D.—Some observations on the Salmonidæ, chiefly relating to their generative function.

Thomas Johnson.—An Account of the Successful Accomplishment of the Plan to transport Salmon Ova to Australia.

Rev. Thomas Hincks.—On some New Hydroid

Zoophytes, and on the Classification and Terminology of the Hydroida.

Rev. Thomas Hincks.—On the Medusoid of a Tubularian Zoophyte, and its return to the fixed condition after the liberation of the Ova.

Dr. J. E. Gray.—On the Whalebone Whale of the British Coasts.

Dr. J. E. Gray.—On New Corals from the Shetlands.

SUB-SECTION D.—PHYSIOLOGY.

The President.—What is the Best Method of estimating the Nutritive Value of Foods and Dietaries?

The President.—Nutritive elements in the Dietary of the Labouring Classes.

Thomas Hayden, M.D.—The relative and special applications of Fat and Sugar as Respiratory Food.

George Frean.—The use of Milk and Scotch Barley as an Article of Diet.

Francis Barham.—The alimentary character of Nitrogen Gas.

T. S. Cobbold, M.D.—Meat as a source of Entozoa.

C. G. Monteith.—On the Lentil as an Article of Food, and its use from the earliest historical time.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

A. R. Wallace.—Progress of Civilisation in Northern Celebes.

Lieut.-Colonel Showers.—On the Meenas, a wild tribe of Central India.

Miss Muir Mackenzie.—A Narrative of her Journeys in the South Slavonic countries of Austria and Turkey in Europe.

Sir Robert Schomburgk.—A Journey to Xiengmai and Moulmein.

Dr. A. Bastian.—Ethnology of Cambodia.

John Crawfurd.—On Human Hybrids or Crosses.

Dr. Shortt.—On some rude tribes supposed to be Aborigines of Southern India.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Major-General Hannyngton.—Some remarks on the French Calculating Machine. (The machine itself was exhibited.)

The President.—Life Tables, by the Swedish Calculating Machine (with Photographs of the Machine by A. Claudet).

Professor Fawcett.—On the Causes which produce the present high rate of Discount.

Professor Levi.—Statistics relating to the Royal Navy.

E. B. Eliott.—Military Statistics of certain Armies, especially of those of the United States.

J. Wilson.—Registration of Births and Deaths in Ireland.

Handel Cossham.—Statistics of the Coal Trade:—Colliers employed, Wages paid, and Social Condition of the Miners employed in the Northern portion of the Bristol Coal Field.

SECTION G.—MECHANICAL SCIENCE.

James Heywood.—Report of the Committee on Uniformity of Weights and Measures.

(Deputations from Sections B. and F. attended).

Professor Rankine, F.R.S.—On Units of Measure.

J. Scott Russell, F.R.S.—Report of the Committee on Gun Cotton.

J. L. Stothert and R. Pitt.—On a Machine for Testing Girders.

J. Symes Prideaux.—On the Construction of Shot Proof Targets.

In the evening at the theatre, Dr. Livingstone gave an account of his explorations in South Africa during the last six years. In order to accommodate the members who were unable to get seats in the theatre, arrangements were made for Dr. Livingstone's account being read simultaneously by Mr. Clements Markham, Honorary Secretary to the Royal Geographical Society, in the Mineral Water Hospital. Both places were filled to overflowing.

TUESDAY, SEPTEMBER 20TH.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

Fleeming Jenkin.—Report of Committee on Electrical Standards.

Professor Hennessy.—Report on the Vertical Movements of the Atmosphere.

J. P. Gassiot.—On the Adaptation of Sulphide of Carbon Prisms, and the use of Telescopes of a long focal distance in the examination of the Sun's Spectrum.

J. Browning.—On a New Form of Spectroscope, in which Direct Vision is obtained with Single Prism.

Professor W. B. Rogers.—An Account of Ritchie's Improvements in the Liquid Compass.

J. Glaisher.—On a New Arrangement for Measuring the Rate of Evaporation by R. von Vinenot.

Professor Hennessy.—On the Regression of Temperature during the month of May.

Fleeming Jenkin.—Description of Electric Resistance Balance constructed by Professor W. Thomson.

Rev. T. W. Webb.—On the Invisible Part of the Moon's Surface.

Rev. W. R. Dawes.—On the Present Aspect of the Discussion respecting the Telescopic appearance of the Sun's Photosphere.

J. J. Walker.—On a Recent Description of an Iris seen in the Lake of Lucerne.

A. Waugh.—On the Spectrum of Polarised Light.

S. Highley.—Description of a Cheap Form of Automatic Regulator for the Electric Light.

R. W. Hardy.—Speculations on Physical Astronomy.

J. Hartnup.—On the Great Storm of December 3rd, 1863, as observed at the Liverpool Observatory.

— Brothers.—Exhibited some Enlarged Photographs of the Moon.

SECTION B.—CHEMICAL SCIENCE.

Professor Wanklyn.—On a Curious Example of Etherification.

A. V. Harcourt.—An Account of some Experiments on the Rate of Chemical Change.

T. Fairley.—On the Action of Hydrogen upon Organic Polycyanides.

Professor W. B. Rogers.—An Account of Apparatus and Processes for the Chemical and Photometrical Testing of Illuminating Gas.

Professor Roscoe.—Description of a Chemical Photometer for Meteorological Observation.

Professor Roscoe.—Contributions towards the Foundation of a Quantitative Photography.

Dr. Paul.—On Useful Applications of Slag from Iron Smelting.

Dr. Williamson.—On Isomorphism.

SECTION C.—GEOLOGY.

Preliminary Report of the Committee.—On the Distribution of the Organic Remains of the North Staffordshire Coalfield.

Sir W. Logan, Dr. Dawson, and Dr. Sterry Hunt.—On Organic Remains in Laurentian Rocks in Canada.

W. A. Sanford.—Notice of Carnassial and Canine Teeth from the Mendip Caves, which probably belong to *Felis antiqua*.

W. Boyd Dawkins.—On the newer Pliocene Fauna of the Caverns and River Deposits of Somersetshire.

Dr. Falconer.—On Fossil and Human Remains of the Gibraltar Cave.

Professor Phillips.—On Distribution of Granite Blocks from Wasdale Crag.

Professor Phillips.—On Excavation of Valleys near Kirby Lonsdale.

Professor W. B. Rogers.—To Exhibit the Cast of a Peculiar Fossil found in Mesozoic Sandstone of the Connecticut Valley.

Section D.—Zoology and Botany.

Dr. Muller.—On *Euphorbiaceæ.*

Dr. E. Perceval Wright.—To exhibit Professor T. Huxley's and Mr. Hawkins's "Comparative Osteology."

Dr. E. Gray.—To exhibit Von Beneden's Work on the Marine Leeches of the Coast of Brest.

Dr. Herapath, F.R.S.—On the Pedicellariæ of the *Echinodermata.*

C. Spence Bate, F.R.S.—On a Human Skull and the Bones of Animals found with Pottery in a Kjökkenmödding, on the Coast of Cornwall.

C. Spence Bate.—On an Ancient Cornish Barrow.

Rev. A. Merle Norman.—Shetland Dredging Report, on the *Echinodermata* of the Shetland Sea.

G. S. Brady.—Report of the Dredging Operations on the Coasts of Northumberland and Durham.

Professor Balfour.—Notice of some Rare Scotch Plants and their Localities.

Jas. Buckman.—On *Datura Stramonium* and *D. Tatula.*

Richard Beck.—Observations on the Spinnirets of Spiders.

J. E. Daniell.—The Mollusca of Bath and an account of a Parasite found in *Anodon Cygnea.*

B. Beddoe, M.D.—On the Testimony of Local Phenomena to the Permanence of Type.

Dr. Baikie.—Extract of a letter from, relative to *Manatus Vogelii.*

M. Moggridge.—The old Welsh Mistletoe Cure for St. Vitus's Dance.

R. Riddell.—On *Balata* and other Gums regarded as Substitutes for Gutta Percha.

C. Ottley Groom.—On the Food of Birds.

Sub-Section D.—Physiology.

J. Hughes Bennett, M.D., F.R.S.E.—The exhibition of a New Sphygmograph, by M. Marey.

B. W. Richardson, M.D.—Report on the Nitrate of Amyle.

J. T. Dickson.—Cell Theories.

John Davy, M.D., F.R.S.—Some Observations on the Horse Chestnut—its composition and uses.

T. S. Cobbold, M.D., F.R.S.—On Vegetables and Fruit as a source of Entozoa.

T. S. Cobbold, M.D., F.R.S.—On Water as a source of Entozoa.

A. Haviland.—The Hour of Death in Acute and Chronic Disease.

T. Junod, M.D.—On the Physiological Effect of the Vacuum Apparatus.

B. W. Richardson, M.D.—The Physiological Effects of Tobacco.

E. Crisp, M.D.—On the Size of the Blood Corpuscules in relation to the Size of the Animal.

Section E.—Geography and Ethnology.

Captain Burton.—On the River Congo.

M'Douall Stuart.—Account of his Journey across Australia.

Albert Walker.—Journey along the West Coast of Middle Island, New Zealand.

J. G. Taylor, H.M. Consul at Diabekir—Notes on Kurdistan.

Sir C. Elliot.—On a recent Earthquake at St. Helena.

Charles M. Doughty.—On the "Jostedal Brae," a Glacial System in Southern Norway.

T. Farrar.—Fixity of the Types of Man.

Professor Harley.—On the Poisoned Arrows of Savage Man.

Section F.—Economic Science and Statistics.

T. Webster and J. F. Bateman.—Report on Scientific Evidence in Courts of Judicature.

Dr. Wilson.—Sanitary Statistics of Cheltenham.

Rev. Dr. Hume.—On the Locality of the various Religious Bodies in Ireland.

F. Purdy.—On the Quantity and Value of Grain imported into the United Kingdom since the Repeal of the Corn Laws.

M. Guerry, of the Institute of France.—On Crime in England and France.

James Heywood, F.R.S.—On the Recommendations of the Public School Commissioners for the Distribution of School Time.

Lieut.-Colonel Kennedy.—On the British Home and Colonial Empire in its Mutual Relations.

W. Tite, M.P.—Health Statistics of the City of Paris.

W. Westgarth.—Statistics of Crime in Australia.

I. Pitman.—On Brief Writing.

Col. Grant, R.E.—Notes on a Cotton Chart, showing the effect of the Civil War in America on Cotton.

R. Herbert.—Statistics of Live Stock.

Section G.—Mechanical Science.

Professor Rankine, F.R.S.—On some of the Strains of Ships.

George Fawcus.—Improvements in Scaling and other Ladders.

George Fawcus.—Improvements in Folding Doors.

Captain A. Henderson.—On the Practical Progress of Naval Arichtecture in Ocean and River Steamers, with Suggestions for Improvements in the Steerage of the Great Eastern, and large and small Iron-clads, Rams, and Gun-boats, similar to the Assam Nautilus, by the use of Balanced Rudders in bow and stern.

Admiral Sir E. Belcher.—On Improvements in the Structure of Ships of War.

Capt. Wheatley, R.N.—On Improvements in the Defence of Ships of War.

Zerah Colburn.—On Steam Boilers.

George Glover.—On Instruments for the Measurement of Gas.

James Williams.—Experiments on the Elasticity of Iron.

H. C. Sorby, F.R.S.—Exhibited and described Microscopical Photographs of various kinds of Iron and Steel.

R. A. Peacock.—On Testing Cables.

George Bell Galloway.—On Life Boats for Ships and Steamers.

George Bell Galloway.—On Improvements in Screw Propellers.

Edward Charlesworth.—The new Elevator Gun.

G. Hartmann.—Description of a Parallel Gauge.

In the evening a Microscopical Soirée took place in the Assembly-rooms, which was very numerously attended.

WEDNESDAY, SEPTEMBER 21st, 1864.

Section B.—Chemical Science.

Dr. G. Kemp.—Memorandum on Ozone.

Wentworth Scott.—On some probable new Sources of Thallium.

Professor W. B. Rogers.—To exhibit the inventions of Mr. Cornelius, of Philadelphia, for Lighting Gas Burners by Electricity.

A. C. Kirk.—On the Production of Cold by the Expansion of Air.

S. Mossman.—Some observations on the Constitution of the Atmosphere.

W. Gee.—Account of the mode adopted at the Bradford Union for the Utilization of Sewage.

Dr. Paul.—On the Disposal of Town Refuse.

Alfred Noble.—On Reaumur's Porcelain.

S. Highley.—Description of a cheap form of Automatic Regulator for the Electric Light.

SECTION C.—GEOLOGY.

W. Bristow.—On the Rhœtic (or Penarth) Beds of the Neighbourhood of Bristol and the South-west of England.

Professor Hennessy.—On Geological Climate.

Dr. T. Hodgkin.—Notice of some Geological Appearances in the North-west of Morocco.

Dr. R. N. Rubridge.—On the Relations of the Silurian Schist with the Quartzose Rocks of South Africa.

Dr. T. Wright.—On the Development of Ammonites.

H. Seely.—On the Pterodactyle as Evidence of a new Sub-class of Vertebrata.

M. Hébert.—Note on some of the Oolitic Strata seen at Dundry.

W. W. Smyth.—On the Thermal Water of the Clifford Amalgamated Mines of Cornwall.

A. Bassett.—On the South Wales Mineral Basin.

E. S. Higgins.—On Otolites.

H. C. Hodge.—On the Origin of certain Rocks, and on the Ossiferous Caverns of South Devonshire.

Professor Tennant.—On Agates found on our Coasts.

Dr. P. Carpenter.—On the Connections between the Crag Formations and the recent Faunas of the North Pacific.

SECTION D.—ZOOLOGY AND BOTANY.

D. W. Brittain.—On the Development of Cysticercus.

Harry Seely.—Significance of the Septa, and Siphuncules of Cephalopod Shells.

Professor Buckman, F.L.S.—On a curious Form of *Aquilegia vulgaris.*

Samuel Highley, F.G.S.—On the Application of Photography and the Magic Lantern to Class Demonstrations in Microscopic Science and Natural History.

Professor Balfour.—To exhibit Specimens of *Cycas revoluta, C. Circinalis, and Cerotozomia Mexicana*, and to make remarks thereon.

George Busk, F.R.S.—On a very Ancient Human Cranium from Gibraltar.

Frank Buckland.—On Salmon Hatching and Salmon Ladders.

Thomas Wright, M.D.—Notice of a New Entomostracon from Plymouth.

Frederick R. Surtees.—On South African Swifts and Swallows.

R. F. Wright.—To exhibit some Trap-door Spiders from Corfu.

SUB-SECTION D.—PHYSIOLOGY.

J. Hughes Bennett, M.D., F.R.S.E.—The Physiological Aspect of the Sewerage Question.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

M. Vámbéry.—A Visit to Samarcand.

John Crawfurd.—On the Sources of the Supply of Tin for the Bronze Weapons of Antiquity.

Samuel Mossman.—On the Atmosphere, showing that there is a difference in its vital constituents North and South of the Equator.

Hyde Clarke.—The Iberians in Asia Minor.

T. Symes Prideaux.—On the Principles of Ethnology.

Sir James Alexander.—Notes on the Maories of New Zealand, with Suggestions for their Pacification and Preservation.

The Duc de Rousillon.—On the Scythians.

W. Martin Wood.—The Hairy Men of Jesso.

Captain Algernon De Horsey, R.N.—On the Comoro Islands.

John Cameron.—On the Islands of Kalatoa and Puloweh.

Keith E. Abbott, Consul-General at Teheran.—On the Province of Azerbaijan.

Sir George Bowen.—Advance of Colonization in North-Eastern Australia.

Excursions, numerously attended, were made to Stanton Drew and Radstock, Frome, Bristol, and the Clifton Suspension Bridge, Salisbury, Old Sarum, and Stonehenge.

At a meeting of the General Committee held on Monday, it was decided that the next meeting of the Association will be held at Birmingham, under the Presidency of Professor John Phillips, F.R.S., Professor of Geology in the University of Oxford.

Fine Arts.

ART IN BELGIUM.—The following notice of art exhibitions now being held at Malines and Brussels has been kindly contributed by Mr. John Leighton, F.S.A. :—The exhibition of objects of religious art in precious metal, wood, ivory, and embroidery, now to be seen at Malines, the ecclesiastical capital of Belgium, was formed there on the occasion of the late Catholic congress, though not completed as a show until the latter part of this month. It says much for the liberal spirit animating the venerable religious corporations on the continent to allow of their being seen by the world at large at all, and that in a secular edifice. The works exhibited consist of implements, utensils, and robes used in the offices of the Roman Catholic church—from the period of the middle ages to our own day—and are exposed to view in an ordinary mansion, the Hôtel Liedekerke, Rue de la Blanchisserie, Malines; and will remain open until October 15th (three weeks longer than was contemplated in the first instance), allowing persons to examine the collection with a complete catalogue—an advantage not enjoyed by the first visitors. It is a great pity that such a fine collection should be shown in the inconvenient chambers of a dwelling house, where nothing is to be gained by *ensemble*, and the watching is rendered difficult; why not have shown them in some of the fine mediæval halls for which Flanders is so famous? For instance, how glorious would the magnificent but deserted hall at Ypres have looked, put to such a purpose. The want of a large hall has been greatly against the effect of the exhibition, that as a show would have been vastly more popular in Belgium, had it been at Brussels or Antwerp; not but that Malines has charms for the antiquary and artist, the capital or seaport could not offer. But in a collection —where the art value, the historical value, and monetary value are alike great—one feels at a loss where to commence even in noting a few objects. Whether to begin with the processional crosses of large size, or the Byzantine crucifixes from the earliest date, enamelled and set with crystals, or with the ivory Jesus of the Renaissance period, fixed upon a cross of ebony, full of the vigour and drawing of Rubens' school, or with the pastoral staves—including one of ivory of the sixth century, or with the Diptiches of the eighth and ninth centuries, or with the Monstrances. Of these, as others, some of the best designing will be found in combination with the roughest work, and *vice versa*. Those numbered 406, 421, 438, (old) and 416 are fine; one from St.

Jacques, at Louvain, and another from Ghent, of the sixteenth century, particularly good—for the period. Of old book covers there are two remarkably early examples, from Tongres and Namur; the one from the Sœurs de Notre Dame de Namur, being both beautiful and marvellous for variety of design, material and workmanship. There is a very fine chalice (344) and an altar cover of Frère Hugo de Oignies which is curiously beautiful—as also a chalice of St. Thomas à Becket. Of Reliquaries many are unique and interesting, though often very quaint in their forms, the finest, perhaps, being that of St. Chandelle, of Arras (twelfth century). The "St. Epine," containing a thorn from our Saviour's crown, was presented by Alexander of Scotland to St. Louis. Mary, Queen of Scots, in 1587, gave it to Elizabeth, daughter of the Earl of Northumberland on the scaffold, by whom it passed to the English college, at Watten, and, upon the suppression of religious houses, came into the keeping of the Bishop of Ghent. There is also a reliquary, in gold, adorned with precious stones and enamel, that once belonged to Margaret of York; and others containing wood from the true cross; portions of the veil of the Virgin: the tooth of St. Nicholas, &c., &c. Of shrines there are many, from a very early date, of gold, of brass, enamelled, jewelled, and otherwise decorated. To enumerate all the remarkable enamels (either cloisonné, Limoges, or other), nielli and *repousséd* work, would be fatiguing; or to tell of all the silver and brass candlesticks, the coronæ, the silver and gold crowns for statues here were impossible. There are a small Mosaic of Roman work, presented by Sixtus IV. to the Prince of Chimay, numerous rings of abbots, religious houses, &c., including one of Sir Thomas More's, and a remarkably fine collar in silver—very picturesque and quaint in its treatment—belonging to the goldsmiths' guild at Ghent. Of embroidered fabrics and priests' vestments there is a grand show, including a tunic of St. Bridget, left by Gunilda, the sister of Harold, to the Cathedral of Bruges; two chasubles that belonged to St. Thomas à Becket, from Tournay, including some of the Renaissance period; whilst in the lower rooms are to be seen some magnificent modern specimens of work, but of inferior design compared with the earlier examples. In modern work, the continental art-workman is pre-eminent, the fault being in the design, which, if good, is apt to be very French, tending to the Renaissance; the fact is, continental architects do not seem to be imbued with a purity of Gothic feeling, being influenced by their own Flamboyant style, which, whilst rich, has not the marked and simple character of the work so well understood of late years by us. It is to be hoped that this exhibition will open the eyes of the Committee of Public Monuments in Belgium to the importance of preserving their monuments and domestic architecture, and encourage a taste wanting it is to be feared, in the upper classes abroad, if we may judge from the poor modern French edifices that are gradually taking the place of the stately old Flemish mansions, of which happily there rest so many examples, though many of them are choked with paint, the leaded windows having given way to large plates of glass in the casements. This is not to be wondered at when the Committee of Public Monuments are themselves painting "stone colour" the lofty and rich tower of Malines Cathedral, and where they do not destroy—restoring with a vengeance—removing in many cases work of great value, for a modern edition which, however clever, must always be a copy, and never can have the qualities of the original. As to the timber houses, they are fast melting away—in Ypres alone some hundreds having disappeared within a few years, as may be seen in the Musée of that town, where they have a nice collection of drawings, by M. Böhm, after the best of them. To that zealous antiquary, Mr. W. H. James Weale (our countryman), who has settled in Flanders, the Belgians are not alone indebted for the exhibition at Malines, but for many manuals and works on the antiquities and art treasures contained in that most interesting kingdom.

Whilst at Malines they have an exhibition of Mediæval art, at Brussels will be found another, somewhat novel in its character, an international exhibition of cartoons, including photographs from colossal drawings in monochrome; the display being held in a temporary building of wood, situated at the rear of the Royal Palace, containing many works of a remarkable character, most of them having been used in the preparation of mural decorations—bearing the marks of the pounce holes and the stilus—an interesting show of a practical character, and not unpopular, if the attendance may be taken as a test. They are of all shapes and sizes—from large spandrils to long friezes—the grandest big as a house, the smallest fit for a book illustration. At the end of the Grand Salon is placed Kaulbach's enormous work, "The Reformation," where Luther, standing in the centre, holds aloft the Bible, which sheds its rays around upon the heroes of the period, our own Shakspeare forming a prominent figure in the foreground. Echter has two designs, I believe executed for a railway station, "The Telegraph," and "The Locomotive;" Müller, of Dussledorf, many religious subjects; Guffens, of Antwerp, several historical incidents connected with that city; Van Orsel, the drawings used by him in the decoration of the Church of Notre Dame de Lorette, at Paris, which is not the most distant capital that sends, for there are several from Vienna and Berlin, including some large and small landscapes, of great power, in black and white, on paper. Of the Antwerp Salon, it may be remarked that it is above an average exhibition—but few of the leading masters of the Belgian school being absent—an exhibition that for arrangement and practical quality would put our Royal Academy to the blush; though an ancient corporation—an academy twice as old as our own—it exhibits many more works and that fairly—none being placed too high for observation—or, where large, above two lines in height; all being in black wooden boxes, that greatly preserve the frames, and make the sides square, much aiding the general effect, the fine fillets of wood between the works filling up the space very agreeably. Of sculpture there is but little and that well displayed; a portion of it with the pictures, but somewhat isolated, to prevent violent contrast. In architecture there are many beautiful drawings, though none are "pretty;" ground-plans and elevations are included; whilst of engravings, lithographs, and other works of Fine Art, there is a good show; even to works in chased metal, the place of honour being devoted to a clock case with figures in relief, a most able work in the round, as vigorous as if from the hand of Quintin Matsys. The Exhibition was well attended on the Sunday morning at one franc, though in the afternoon it would be free to the public in general.

The Louvre.—Immense additions and improvements have been made this year, and are still being made, in the galleries of the Louvre. The "Musée Napoleon III." presents something new every month. The opening of the principal rooms of this collection has been already referred to, but only in very general terms. The largest of these has an interesting history of its own; it was formerly known as the *Salle des Séances*, and is now called the *Salle des Terres-cuites*. It is not one of the original rooms of the edifice of François I.; in his time it formed two apartments, one being used for the *Tribunal des chasses*, where all matters connected with the chase were discussed and settled; the other contained the collection of naval models. In 1755, these two rooms and those above them were all thrown into one, making a fine hall, and under the government of Louis XVIII. it was used for the ceremony of opening the chambers, whence its late name. The new *Salle des Etats*, in the new portion of the Louvre, was built, and is now used, for the same purpose. It was in this room that the *Musée Napoleon III.* was commenced, but until lately its contents were of a heterogeneous character. The alterations and decorations recently completed are very judicious

and elegant; the false ceiling, which was a mere decorative painting on canvass, has been replaced by one of ground glass, which has produced an extraordinary improvement, not only as regards the amount but also the disposition of the light, that falling from above doing away with the shadows which formerly arose from the deep embrasures of the windows and the projections of the glass cases. These latter are of polished ebony, and with the antique red colour of the walls and the liberal gilding of the ornaments produce a very charming effect. Beneath an ornamental architrave stands a reproduction in bronze of a well-known figure of "Victory," by Brescia. In the centre, on open stands, is a noble collection of Etruscan vases and sarcophagi of large size and of the most remote epoch. The vases were made simply to hold water, oil, or wine, but the purity and elegance of their form renders them worthy of being placed in the first rank of ceramic ware. They are, moreover, ornamented, by mouldings on the clay before burning, with circles, geometric figures, friezes representing sphinxes, sacred animals, and hunting scenes, all exhibiting an amount of art applied to vessels of common use that shows a high state of artistic feeling. The series of sarcophagi includes specimens of all sizes; the largest are surmounted by figures of the deceased occupants, lying on the funeral couch and holding in their hands the symbolic crown indicating that the circle of life is closed. In some instances the figures are crowned, and have a collar around the neck; these are supposed to imply that the occupants were enrolled in the list of *Dieux manes*, or saints. One of these large sarcophagi is peculiar; the figure of the defunct lies supported on the left arm, holding in one hand a patera, and in the other a *flabellum*, or sprinkler of libation, in the form of a lotus leaf; around the funeral couch are five winged genii of death, and the sarcophagus is decorated with a running ornament composed of griffins and sea-horses, fabulous animals, supposed to convey the dead to the happy isles. All these figures are separate, and may be detached from the sarcophagus, which is closed by another moveable ornamental piece. The small sarcophagi are in the same style as this last, but in their case the ornaments are much more elaborate; they generally represent warlike episodes, such as the battles of the Centaurs and Lapithœ; the combat between Eteocles and Polynices, &c. One only represents a domestic scene, a man and woman lying on a funeral couch surrounded by their family and slaves, in accordance with the habits of the time, the slaves being represented as children. Some few of the sarcophagi are not of clay, but of marble, and in the case of the latter the sculpture is of a very superior character. One design includes ten figures, and represents the carrying off of Helen. Some of the heads are gone, but what is left is full of beauty and ease. One specimen, probably more recent, or the work of an inferior artist, represents a family travelling in a chariot drawn by two horses, coupled by a yoke, the head of the family leading on horseback; the details are curiously elaborate, but the execution is very poor. Other examples are ornamental with historical or mythological subjects, such as Orestes pursued by the Furies; Charon guarding the gate of the infernal regions; and the sculptures in general bear marks of colour in which blue and bright reds predominate. The other works in terra-cotta are enclosed in glass cases placed against the walls; these are of larger size than those on the sarcophagi, and served for the decoration of temples; some are separate, while others form friezes. The subjects are all from the Greek mythology, the most common being the labours of Hercules, the exploits of Theseus, and the doings of Jupiter, Bacchus, Minerva, Apollo, and the Seasons—Autumn being accompanied by a pig, Summer by corn, and Spring by flowers. These bas-reliefs form really an exquisite gallery, and some of the sculptures are of high value, and will doubtless attract the eyes of all artists and connoisseurs who may visit the Louvre. Amongst the most remarkable are:—Medea poisoning the dragon, while Jason seeks the golden fleece; Ulysses and the Syrens; Ariadne lying on a panther; several combats of Amazons of great beauty; and Perseus delivering Andromeda, a composition which it would be difficult to match in the whole round of art, antique and modern. With these friezes and metopes are a number of specimens of running frieze mouldings, used to finish off the walls and hide the edges of the tiles; these are ornamented with heads of gods and goddesses, and of animals, masks, leaves, and flowers, and are the perfection of ornamental modellings. The sculptor must either have executed them *in situ*, or he must have studied with great care all the circumstances of their intended position; their coarseness when viewed nearly, and their beauty at a proper distance, are equally remarkable. A smaller room adjoining contains an exquisite collection of small works, brought from Tarsus by M. Victor Langlois, when on a mission for the Government. These consist of statuettes, collars, funereal ornaments, comic and other figures, to be worn as ornaments, buffoons, and what not. They are full of life, movement, and comicality, and marvellously executed. Amongst them are some objects of greater importance; a small bull, for instance, in the best style, female heads of great beauty, and heads of men remarkable for their vigour and the amount of character exhibited in small compass. Lastly, there is a fine collection of jewellery, exhibiting everywhere indications of true artistic genius—rings, bracelets, earrings, light and graceful as can well be imagined, and leaving our modern artists and artizans little cause to smile at the works of the elegant purveyors to beauty who lived twenty centuries ago. The Pope has just sent to the Emperor the lance which was found in the tomb of Charlemagne; this will be placed in the *Musée des Souverains*, in the Louvre.

Manufactures.

"GREENBACKS."—In the Washington correspondence of the *Cincinnati Gazette* is given the following description of the manner in which the manufacture of these notes is effected:—To obtain access to the note-printing bureau requires a pass from the Secretary of the Treasury himself. For obvious reasons it is a privilege rarely granted, and never except under the most thorough surveillance. No lady not employed upon the work is ever permitted, under any circumstances, to enter that part of the department. If for no other reason, the crowded machinery would make it dangerous. The machine shop is the first room entered; it is supplied with forges, lathes, planes, and drills, capable of doing all the repairing necessary to be done to the machinery of the building, and to the setting up and working of such new machines as are demanded by our extensive paper circulation. The paper mill, though not as extensive as one for general manufacturing, is sufficient for all the labour required in making the note printing paper. The manufacture of a paper combining the qualities of wear, and being splitless and unphotographic, was a much-desired desideratum. Accordingly, it was resolved to make some experiments, which were entrusted to Dr. Gwynn. He has produced a paper as firm as parchment, smooth as satin, and of a combination of materials known only to himself, and secured to the exclusive use of the Government. He has introduced into it a fibre which cannot be photographed without discolouring the paper to which impressions may be transferred, giving it the appearance of a coarse, black spider-web. Being moulded into the body of the paper, it is impossible to erase it, and it must be a great preventive of counterfeiting by the photographic process, which has lately been the most successful. The ink mills are six in number, for making as many different colours. Each one is called a 4-horse power mill, though the whole six are driven at the same time by an engine which one could

pick up with one hand. It not only turns these mills, but at the same time runs three Hoe cylinder presses. It was made in the machine shop of the department, and derives its force from its great boiler capacity. The engraving room is of more interest than any we have yet been in. Here science and art are both displayed to perfection. There is, perhaps, no engraving so fine, and requiring so much time to execute, as that on the plate now being prepared for national note-printing. One, the size of a bill, on which the workman has been employed almost a year, is a copy of one of the paintings in the rotunda of the Capitol. The figures are of exquisite proportions, and the water-lines, though plain, extremely delicate in their tracery. With the single plate, as it comes from the hands of the engraver, it would be impossible to do the printing required, and as it is equally impossible to have a number of plates engraved, it becomes necessary to repeat them in another way. This is done in the following manner:—The engraving is done on a plate of soft steel, just the size of the bill or bond, and the cuttings are indentations. When finished, the plate is hardened and taken to a "transfer press," where a roller of soft steel, just of a circumference to take in the size of the plate, is rolled over it under heavy pressure, leaving the impression on the roller in a raised form. This roller is in turn hardened, and then any number of flat plates similar to the original are prepared and receive in like manner the impression from this roller, and become *fac-similes* of the plate engraved; and we have produced in a few minutes what it has taken months with chisel and eyeglass to make! The printing is now done on the old-fashioned engraver's press, being nothing more than a simple iron roller, covered with cloth and paper, to press the paper into the indentations, placed in a strong frame, and turned backwards and forwards by hand, by spokes placed in the end of the roller. Two persons work at each press—a man and a woman—the former attending the plate, the latter the paper. The plate is kept warm while working by a gas heater. The sheets when printed are each laid between other sheets of thin brown paper, to keep them from blurring, and sent in hundreds to the drying-room. The first process of bond printing is numbering the coupons and the denomination with a yellow mordaunt, and, as they fly from the press, they are bronzed, as they appear when issued. Yellow is used because it cannot be photographed without showing too plainly to be mistaken, as was remarked about the fibre in the paper. This discovery was made in the following manner:—When Mr. Clarke was at the head of the Bureau of Construction, he had a map made for military purposes, which it was necessary to repeat. It was photographed, and an obscure road marked with a faint yellow line was discovered to be black in the copies. He then photographed a specimen sheet of inks or paints, and of all the colours, except black, —yellow was the only one which might not have been altered with ease with a touch of the brush. It was black as the black ink itself. Hence any attempt to photograph this colour will only lead to discovery—and, as it is the groundwork of bonds and other securities, and covered by the printing, it seems another security against fraud. The series-numbering is the last process before trimming. The work is done by women, the machines being worked by a treadle. The figures are placed in the edges of six discs, placed side by side, and fastened to an arm worked by the treadle, something after the style of a Wheeler and Wilson sewing machine. The discs are turned by a ratchet, and will number from 1 to 999,999. For consecutive numbering, a little hook is attached to the ratchet, and the machine shifts itself. Otherwise, the discs are turned by the number. The trimming and cutting was formerly done by hand, and of course very imperfectly and laboriously. There were two things to be overcome in cutting by machinery—the inequality of the register and the shrinkage. It was desirable that the edges should be trimmed, that they might wear well. If cut with a straight knife they would be bevelled one way. As they are now cut, with circular knives, they have an edge bevelled both ways. The greenbacks are printed four on a sheet. One machine trims the margins, and another separates them. This latter is an ingenious contrivance. It slits them very fast, and lays them regularly in a box, each series of numbers separately. The notes are lettered A, B, C, and D, and the numbers on each are the same; therefore it is essential they should be kept carefully apart. Each of the boxes that receives them has a moveable bottom. When the cutting for the day first commences, this bottom is near the top of the box, but as the cutting progresses and the number of the bills increases, a ratchet lets the bottom drop the thickness of a bill, so the box is kept just so full all the time to make a bill slide in without doubling. It is intended that the cutting should be a criterion by which to judge of the genuineness of the bills, for every one must be the same width and length. If the end of a bill be placed on the centre of another, there will be found no difference in the width—an exactness which cannot be given by the hand. The currency-cutting machine is more complicated, as it cuts both ways, and files them in bundles of five dollars each, and I am not sure but it binds and seals them. Wet printing is the process now used in this establishment. The wetting is done by cloths instead of by dipping or sprinkling, as in newspaper printing. A room is prepared especially for this, with iron weights for pressing. Each man has his particular place assigned him, and all work in harmony, and with precision and celerity. Ordinary bills are wetted and dried three times during the printing; but this process will soon be done away with, for preparations are being made to substitute dry printing in its stead, in which there will be at least two advantages—speed and better work. To do this some eighty heavy hydraulic printing presses are being set up, when what is called dry-printing, or printing on dry paper, will, for the first time, be successfully performed. There is a very perceptible difference between the present way and the one to be substituted. Specimen sheets show a clearer impression and a remarkable distinctness with which the faintest water-line is made to stand boldly out. This process, which is entirely new, has only been introduced after the most vehement and virulent opposition. All sorts of stories were circulated of the building being crushed down, of there being an impossibility to take with a machine more than seventy-five impressions per day, and a hundred others of a similar character; but, inviting men of judgment and skill in machinery to test the feasibility of the plan, Mr. Chase went on and instructed Mr. Clark to continue the experiments and perfect the system. The first tests were made with hand pumps. Machine pumps are now being rigged, and the whole will soon be in motion. The checks and safeguards upon everyone employed in this department, from the chief down to the lowest labourer, operate at every turn. Not even a blank sheet, much less a printed one, is passed from one hand to another without being counted and receipted for; and unless there is collusion from one to another through every process through which the paper has to pass before it is money, through the entire range, there cannot be an over-issue. The paper is issued from one room, and is re-issued from that room sixteen or eighteen times before it is put into circulation; being counted, charged, and receipted for each time, and re-counted, re-charged, and receipted for through each process that it passes after leaving this room. Five hundred persons are employed in note, bond, and currency-making. It would seem as if this number ought, in a month's time, to turn out money enough to carry on half-a-dozen such wars as we have on hand. But a million of dollars in notes of the required denominations to do the current business of individuals, is an immense pile of paper, and when it comes to hundreds of millions, they grow into small haystacks as to size. By the present

process of printing each pressman takes about five hundred impressions per day. By the hydraulic presses, it is expected that from three to five hundred impressions per hour will be taken.

COTTON.—16,000 kilogrammes of raw cotton, grown in Persia, have arived at Rostow, on the Don. This is a first experiment made by manufacturers in the central provinces of Russia.

THE FLAX TRADE.—Mr. Baker, one of the Inspectors of Factories, in his last report, says that this trade is, to all appearance, exceedingly prosperous, and every spindle and loom is working full time. The efforts for flax cultivation are likely this year to be most successful. It is said that 300,000 acres have been sown in Ireland, and that large imports of flax will enable the manufacturers to tide over the time till our own growths are available. The words "to tide over the time" are quoted from a Belfast letter, as one of the strongest proofs of a possible scarcity of flax as well as cotton. By a return recently made to the Belfast Linen Trade Committee by the mill occupiers, it appears that, though there are eight fewer spinning mills in 1864 than there were in 1859, and 1,098 spindles less, yet that there is an increase of fourteen per cent. more spindles at work in the latter than there were in the former year. Moreover, there are five new mills in the course of erection, capable of containing 45,000 spindles, in addition to an extension of spindles in the present mills of 50,638, making a total increase of spindles 95,638. With respect to linen power-loom weaving, it appears from this return that in 1859 there were only twenty-eight weaving factories, containing 3,633 looms, whilst in 1864 there are forty factories, containing 8,187 looms, or an increase in five years of upwards of 125 per cent. Such is the result hitherto of the great efforts which have been made to prosecute successfully the flax manufacture in Ireland, a manufacture which carries agriculture along with it, and enhances both. In England, on the contrary, between 1856 and 1862 the flax spindles decreased upwards of twenty-eight per cent., and although we could have grown all the flax we needed at home, we have been content to import it, and to pay to the foreign farmer what we are now beginning to see might as well have been distributed amongst our own people. It is hoped, however, that the attention of our English farmers has now been sufficiently directed to the subject; for though there may be some differences between the soil of England and Ireland as to their applicability to flax culture, and in the price of agricultural labour between the two countries, yet our agriculturists may rest assured that the Irish farmers are alive to their own interests, and that a specific culture would not have increased by upwards of 60,000 acres for two years in succession, unless the advantages had been commensurate with the risk and outlay. In addition to the great improvements in machinery, whereby it is intended that the scutching process shall not only be economised and perfected, but brought home to the farmer's door, it is stated that a new process of retting has been discovered, whereby the flax, when grown, can be brought to market much more readily than under any former system. It can now be retted in a few days, it is said, in the most costless manner, without prejudice to the fibre—indeed, with actual advantage to it, and without the offence which line ponds are apt to communicate to a neighbourhood, both in the air and in the flesh of the animals which happen to feed in or near them. If this is so, a great stride in flax culture has been made.

Commerce.

CULTIVATION OF TEA.—A Sydney paper recommends the attempt being made to cultivate tea in Australia. It says:—"The tea-plant grows very well in the Botanical Garden at Brisbane, and there are many parts of South Australia where it would grow equally well. China has so long had the monopoly of the tea trade, that people have come to think that to China alone we must continue to look. There is nothing special in the climate or soil of the tea-growing districts in China—nothing that cannot be matched elsewhere. The greatest progress in tea cultivation is being made in India, where, on the slopes of the Himalayas the cultivation is being carried on with great energy and success. The drawback to tea cultivation is, that some years are required before the first returns come in, and that, therefore, some patience and capital are requisite to enable the grower to wait for the fruits of his labours. The value of the tea exported from India has risen from £17,244 in 1842, to £192,242 in 1862. It has taken a long time, however, to give this industry a thorough start. It was in 1834 that the Government first directed its attention to the subject, and instituted inquiries which ultimately led to the formation of a plantation. Thirty years have elapsed since then, though the cultivation is now beginning to assume great commercial importance. We have the advantage of some Chinese labour which might be turned to account, and if we could add Anglo-Saxon capital and enterprise to the patient, plodding Chinese, we might perhaps get at results that would surprise us."

Colonies.

THE QUEENSLAND SHEEP INVESTMENT COMPANY.—A Sydney paper says:—"A new Anglo-Australian Company, under the title of 'The Queensland Sheep Investment Company,' has been brought before the public. The capital is to be £400,000, and the object is to buy and work sheep runs, chiefly in Queensland, but also in the other colonies. There seems to be a rage in England for forming new companies, and, under these circumstances, it is only fair that Australia should come in for a share of the golden shower. There is room for a judicious investment of English capital in Australia, and the process may benefit the colony as well as the investors. The latter may draw good dividends, and the former may enjoy to advantage the use of the capital. Not that everybody will be gratified. We have a class of politicians amongst us who cordially detest all Anglo-Australian companies, because they look upon all dividends sent to London as so much profit of which the colonists have been robbed, forgetting the capital that was first sent out to earn the dividends, and that the productive employment of that capital has stimulated local trade, and left a margin of local profit that would not have existed but for the importation of the capital. Local lenders of money do not care to see English capital venturing here, because it tends to reduce the local rate of interest; and local purchasers do not care to have to buy properties in competition with the agents of English companies. But, though there are some interests in favour of close markets, the colony, considered as a whole, gains by every importation of English capital which can be profitably invested. English investors, however, will do well to exercise caution as to the colonial ventures they make. Many companies have been got up which have been little better than swindles. Flaming prospectuses have been issued in London, which, when read on this side of the world, where both the properties and the vendors were known, have excited no small astonishment at the gullibility of the British public. Lands and mines of an alleged fabulous productiveness have been sold to credulous shareholders, and have never yielded a profit equal to the value of the parchment by which the fee simple was conveyed. Such instances, which unfortunately have been too frequent, ought to make buyers cautious. But there are always dupes to be found. It would be a safe rule for English buyers never to purchase a colonial property on the recommendation of the seller merely, however plausible may be his description. I

the property is really worth the price asked for it, it will bear inquiry; and a *bona-fide* vendor would not object to a conditional sale dependent for its ratification on the approval of some reliable colonial referee competent to advise the buyers as to expediency of the purchase. With some such guarantee as this as to the soundness of the investment, there are many things into which English capitalists may freely place their money in these colonies, and draw therefrom a steady and lucrative return."

INTERCOLONIAL TRADE.—An Adelaide paper states that this has assumed a briskness which has not been paralleled for a considerable period. This may be attributed to the shortness of crops and the exhaustion of the stocks of bread stuffs in the adjacent colonies. Besides the regular trading steamers to Melbourne fully employed, there are sailing vessels forming quite a fleet, their tonnage amounting in the aggregate to about 6,000 tons.

Obituary.

CAPTAIN JOHN HANNING SPEKE, the discoverer of the source of the Nile, was the second son of Mr. N. Speke, of the Jordans, near Ilminster, Somerset. He was born in 1827, and entered the army in 1844. In 1854-5, in conjunction with Captain Burton, he undertook an exploring and hunting expedition in Somali Land and other parts of Africa, and there suffered severely from wounds inflicted upon him by the Somali. In *Blackwood's Magazine* he subsequently published an account of his adventures. After his return to England, in the summer of 1855, he joined the Turkish Contingent, and proceeded to the Crimea. When the war was closed he projected an expedition to investigate the *Fauna* of the Caucasus, but abandoned the plan on receiving an invitation to rejoin his old leader Burton in a new expedition to Africa. It was while on this expedition that he first heard, from an Arab merchant, of the existence of the Victoria Nyanza, for which discovery he received the gold medal of the Royal Geographical Society. This was in 1858. Captain Burton at that time lay sick at Kayek. Leaving his leader, Captain Speke penetrated to the Nyanza, and found its waters were sweet, and that it was three or four thousand feet above the level of the sea, on the high plateau-land forming the watershed between Northern and Southern Africa. He thereupon became convinced that this body of water must be the great southernmost reservoir, out of which the White or Main Nile flowed at its northern end. He then returned to England. Sir Roderick Murchison strongly encouraged him to enter upon a fresh journey. Assisted by the Geographical Society and by the Government, Captain Speke enlisted Captain Grant in his project, and these two officers followed the Nile from its source to its mouth. He was killed on Thursday, the 15th inst., by the accidental discharge of his gun, while shooting in Wiltshire.

CHARLES WENTWORTH DILKE, Esq., died August 10, at Alice Holt, Farnham, the residence of his son, Sir C. Wentworth Dilke, Bart., aged 74. Mr. Dilke was born on the 8th December, 1789, and at an early age obtained an appointment in the Navy Pay Office; being fond of literature, he turned his leisure to good account, by writing for reviews and magazines; and in 1814 edited a valuable collection of old plays. In June, 1830, he became part proprietor of the *Athenæum*, and for sixteen years was sole editor. This paper, commenced by Mr. Silk Buckingham, in January, 1828, had long been conducted at a loss. Mr. Dilke, in conjunction with one or two friends, purchased it, and after a few months they were able to announce a most favourable prospect of ultimate success; but his partners were alarmed at the steady drain on the funds, and the major part retired. Like the *Literary Gazette*, the price was 8d.; in August, 1831, the proprietors reduced it to 4d. The experiment was a bold one, but Mr. Dilke argued, "if the readers of literary papers be so few as some imagine, who were the 30,000 purchasers of the early volumes of the Family Library? Who the 14,000 purchasers of the Lives of the Painters?—a subject limited in its interest to the highest and most refined class of informed minds." Taking this wide and comprehensive view of the literary public, the *Athenæum* of August 6th came out at 4d. All the back numbers were reduced to the same price. Most of the leading publishers held aloof; several of them being more or less connected with journals of their own; and amongst the advertisers in this number, are only found the names of Fisher, Tilt, Whittaker, Parker (Oxford), Strange, Kidd, Boone, Hailes, and Moxon, besides Cochrane and Co., who took the back page—nor did the large publishers come in for some time. Mr. Dilke did not, however, rely upon lowness of price exclusively for success; but sought the aid of many of the literary celebrities of the period; and among the known contributors, as early as 1832, are the names of Thomas Carlyle, The Ettrick Shepherd, Allan Cunningham, T. K. Hervey, Thomas Hood, Leigh Hunt, Charles Lamb, William Roscoe, and others. Talent and lowness of price thus combined secured a large influx of literary readers. The first six numbers for the year 1832 were reprinted in rapid succession. This seems to have induced the editor to introduce into his journal a series of articles on the Literature of the Nineteenth Century, as some data for current reading. These articles were given in extra sheets, without additional cost, and comprised: English Literature, by Allan Cunningham; French, by Jules Janin; German, by Dr. Wolff; Spanish, by Don. A. Galiano; American, by Rev. Timothy Flint; Ottoman, by Von Hammer; Polish, by Stanilas Kozmian; and Arabic and Persian, by Meezra Ibrahim. Mr. Dilke appears to have been ever on the watch for special matters of literary interest, hence the purchase of Joseph Haslewood's manuscript relating to the celebrated Roxburghe Revels, the publication of which in the pages of the *Athenæum* attracted so much attention at the time. Having brought the journal to a foremost position, Mr. Dilke in 1846 entrusted the editorship to Mr. T. K. Hervey, only occasionally contributing articles on the literature of the eighteenth century, having reference more especially to Pope, Wilkes, and Junius. Mr. Dilke did not remain long at rest; the first number of the *Daily News* was issued on the opening of the Parliament for 1846, and the talent employed, together with the ample funds at its command, seemed to anticipate the very best success. In a few months, however, these anticipations were dispelled, and in the difficulty Mr. Dilke was consulted, and ultimately consented, in connexion with his son, now Sir Wentworth Dilke, by whom he has been always ably supported—to take its management for a limited period. He accordingly introduced into that newspaper the free and independent spirit he had infused into his own journal, and at once reduced the price from 5d. to 2½d.—It must be borne in mind that this was virtually to reduce the price to 1½d., as the compulsory 1d. stamp was then in full force—thus the *Daily News* became the forerunner of the cheap daily press. The boldness of the prospectus issued by Mr. Dilke, read by the light of our every-day experience, is singularly instructive. A few words of extract may be of interest. "The newspaper is the intellectual life of the nineteenth century—the great agent of modern civilization. Not to speak of the moral and political safeguards which it affords, it places all, whatever their varieties of fortune and position, on a level as to information. By its means only, the capitalist is enabled to contend successfully against his wealthy rival for a knowledge of those changes which affect supply and demand, and, therefore, prices. The number and character of the newspaper press of any country are an admitted test of the enterprise and intelligence of the people." The first issue at the reduced price took place on the 1st of June, 1846, and reached a sale of from twenty-five to thirty thousand copies. For

several years previous to his death Mr. Dilke had ceased to take any active part in journalism; but, shut up in the retirement of his library, he worked incessantly, his chief studies being the History of England under Queen Anne, the authorship of the Junius letters, and the Pope mysteries. It is to be hoped that these researches of his later years may at some future time be issued for the public service. The remains of Mr. Dilke were privately interred at Kensal Green, on the 16th ult., followed to the grave by members of his family and a few of those friends who had known him well and respected him in life. Amongst those present were Mr. Hepworth Dixon, Mr. John Forster, Mr. James Holmes, Dr. Doran, Mr. Thoms, Mr. John Francis, and others. Twelve of the oldest employés from the printing establishment also paid their tribute to the memory of the deceased by their presence. He was elected a member of the Society of Arts in 1849.

Publications Issued.

Les Industries Parisiennes en 1860, d'apres l'Enquete de la Chambre de Commerce. (Statistics of Paris Industry, &c.)—This is a very important work, the result of an inquiry set on foot four years ago by the Chamber of Commerce, and fills more than eleven hundred quarto pages. It is the result of the joint labours of M. Moréno Henriquès and M. Emile Cottenet, who have prefaced the work with an admirable *resumé* of the results of the inquiry. This is the second census of the kind that has been taken, the former having been commenced in 1847 and finished in the following year. The work now before us gives the total number of known industrial establishments in Paris at 101,171; of these 7,492 only furnish employment for more than ten workmen; 31,480 have from two to ten each; and the remaining 62,199 consist of small masters, who either employ one man or work alone. The total annual value of the productions of Paris is set down at nearly £135,000,000; the estimate—for it can only be approximative—in 1849 was 58½ millions. Of the former amount, the trades connected with food and drinks supplies 43 millions, clothing 18 millions, and the building trades 12 millions. The exports for 1860 are given at nearly £14,000,000, of which America took £3,000,000, England £1,390,000, and Russia rather less than a million sterling. The total number of working people is given as 416,811, of whom 105,410 women and 25,540 children, male and female. The average of wages is reported to be as follows:—64,080 workmen earn from one to three francs a day, 211,621 from 3 fr. 25c. to 6 francs, and the remaining 15,058 from 6 fr. 50c. to 20 francs per diem; of the workwomen 17,203 earn from 50 centimes to 1 fr. 25c.; 83,340 from 1 fr. 50c. to 4 francs; and 767 from 4 fr. 50c. to 10 francs per diem. The trades are thrown into ten principal groups:—1st. food; 2nd, building; 3rd, furniture; 4th, clothing; 5th, spinning and weaving; 6th, the common metal trades; 7th, gold, silver, and the other precious metals; 8th, chemical and ceramic manufacture; 9th, paper, printing, and engraving. The tenth is divided into several groups:—1st, instruments of precision, music, and clock and watchwork; 2nd, skins and leather; 3rd, saddlery and military equipments; 4th, brushes, brooms, &c.; 5th, ornamental wares (*articles de Paris*); 6th, miscellaneous employments, including balls and concerts, baths, hotels, &c., public vehicles, and the public establishments for slaughtering, prison workshops, the services of the sewers, streets, and the Imperial establishments for coining, printing, tobacco manufacture, gas works, theatres, &c. It is the comparison, not of totals, but more particularly of special employments, that gives these and other similar statistics a real value in the eyes of foreigners, and therefore the most prominent instances in each group have been extracted, giving the number of workmen and the average rate of wages in each case:—The butchers number 2,697, are generally fed and clothed by their employers, and receive from 1 franc to 9 francs per diem wages; bakers, 4,489, earn from 1 franc to 8½ francs; distillers, 548, earning from 75c. to 8 francs; grocers, 2,624, wages from 50c. to 4½ francs; waiters and others in cafés, 4,068, generally fed and lodged in the establishment, from 1 franc to 10 francs; restaurants, 7,340 people employed, earning from 50c. to 10 francs, and living in the house; wine shops employ 5,378 persons, who earn 50c. to 6 francs, in addition to food and lodging; house carpenters, numbering 5,015, earn from 2½ to 12 francs; masons, 31,676, from 2½ to 12 francs; joiners, 8,792, from 3 to 10 francs; painters, 6,147, from 3 to 12 francs; iron workers, for building, 6,175, earning from 3 to 11 francs; bronze manufacturers, 2,339, from 1fr. 75c. to 15 francs; bronze founders, 499, from 1 to 10 francs; bronze mounters, chasers, and turners, 1,441, from 1 to 7 francs; bronze gilders, lacquerers, &c., 914, from 1 to 7 francs; imitation of bronze in zinc, &c., 539, from 1½ to 15 francs; moulding and picture-frame makers, 1,764, from 1 to 9 francs; gilders on wood, 1,357, from 1 to 8 francs; cabinet-makers, 7,951, from 1fr. 75c. to 12 francs; chair-makers, 3,421, from 1 to 10 francs; lamp-makers, 1,543, from 2 to 12 francs; iron bedstead-makers, 681, from 2fr. 25c. to 18 francs; marble-workers, 1,620, from 1fr. 25c. to 10 francs; paperhangings, 4,459, from 1 to 15 francs; decorative painters, 326, from 1½ to 20 francs; cabinet carvers, 707, from 2½ to 15 francs; carvers on wood for bronze and goldsmiths' work, 342, from 2 to 12 francs; upholsterers, 3,591, from 1½ to 12 francs; washer-men and washerwomen, 9,574, from 1 to 8 francs; hosiery manufacturers, 3,223, from 50c. to 7½ francs; hatters, 3,354, from 1 to 15 francs; shoe-makers, 18,082, from 75c. to 10 francs; stay-makers, 2,254, from 1 to 6 francs; needlewomen, 5,191, from 1 to 10 francs; shirt-makers, 1,632, from 75c. to 10 francs; dress-makers (modistes), 3,352 men, from 1 to 10 francs, and 1,118 women, about the same, and boarded in addition; ready-made clothing, 2,617, from 1½ to 10 francs; tailors, 10,271, from 1 to 11 francs; shawl manufacturers (the imitation Cashmere and other kinds), 1,930, from 75c. to 20 francs; designers, 930, from 75c. to 20 francs; trimming-makers, 8,426, from 50c. to 9 francs; dyers of yarns and tissues, 1,007, from 1fr. 25c. to 10 francs; weavers of all kinds of tissues except sacking, 2,488, from 50c. to 20 francs; boiler makers, 2,254, from 1fr. 75c. to 15 francs; cutlers, 320, from 75c. to 7 francs; tinmen, 1,359, from 1 to 6 francs; metal founders, 4,026, from 50c. to 15 francs; machine-makers and engineers, 8,627, from 1½ to 20 francs; chemists, druggists, and herbalists, 1,501 pupils and workmen, from 1 to 8 francs; the greater part of the pupils and lads being boarded in the establishment; porcelain-makers, 235, from 2 to 20 francs; porcelain decorators, 1,872, from 75c. to 12 francs; chemical manufacturers, 1,749, from 75c. to 10 francs; glass workers, 933, from 75c. to 10 francs; line engravers, 139, from 1fr. 75c. to 12 francs; wood engravers, 109, from 75c. to 15 francs; block cutters for printing stuffs and paper, 221, from 75c. to 7 francs; seal engravers (in metal), 625, from 50c. to 10 francs; lithographic and copper-plate printers, 3,219, from 50c. to 12 francs; letter-press printers, 6,158, from 50c. to 20 francs; book-binders, 2,499, from 50c. to 8 francs; watch and clock-making, and frame-making for ditto, 2,386, from 75c. to 12 francs; musical instrument makers, 928, from 75c. to 10 francs; optical and mathematical instrument makers, 3,108, 50c. to 15 francs; organ-makers, 1,513, from 1 to 15 francs; lighthouse-makers, 340, from 2½ to 12 francs; pianoforte-makers, 2,101, from 3 to 12 francs; curriers, 1,660, from 50c. to 2 francs; tanners, 1,286, from 1 to 9 francs; coachbuilders, business set down at more than a million sterling per annum, of which one-fourth is for exportation, employs 4,957 workmen, at 75c. to 12 francs; military equipment makers, 5,487, from 75c. to 8 francs; artificial flower-makers, amounting to a total

of considerably more than a million sterling per annum, of which about one-third for exportation, 7,831, from 50c. to 10 francs; hack carriages of various kinds occupied 1,845 persons, at wages of from 3 to 8 francs. Amongst the public establishments the following are the most important:—The abattoirs occupy more than a thousand persons at salaries varying from 1 to 17 francs per day; the clearing of the streets, sewers, &c., 3,543, the sweepers varying from 1 to 3½ francs, the waterers 2½ to 3 francs, and sewer men 3 to 4fr. 40c. The markets occupy 290 persons, paid by annual salaries, and 1,500 to 1,800 porters and 600 other persons, according to the season, at from 3fr. 50c. to 11fr. 60c. The Imperial printing establishment, 881 persons, at from 2 francs to 6fr. 50c. The Gobelins manufacture, 103, paid annual salaries (not given), and generally lodged and boarded in the establishment. The tobacco manufactory employs 3,140 persons, the average rate of wages being for the men from 3fr. 54c. to 3fr. 38c., and for the women from 1fr. 86c. to 2fr. 34c. per day. The theatres, of which there are 33 in Paris, give employment to no less than 2,588 artistes and assistants of various kinds, the total of their salaries and wages amounting in 1860 to 4,454,537 francs, or £178,181, while the administration occupied 439 persons, whose aggregate salaries amounted to 502,349 francs or £20,000, and 822 working men, whose wages averaged 5fr. 25c. per day. The gross receipts from omnibuses were 14,894,284 francs, or £595,671, and they occupied 2,430 persons at 2fr. 75c. to 5 francs, and 620 workmen, at an average of 4 francs per day. The total receipts from hack-carriages were more than £480,000, and gave employment to 3,793 functionaries, at salaries of from 2fr. 60c. to 5 francs, and 986 workmen, paid from 3 to 7 francs per day. The gas works employed 2,691 workmen, whose aggregate receipts amounted to £93,672 in the year, when the consumption of gas was 75,518,922 cubic metres.

Notes.

ROYAL SCHOOL OF NAVAL ARCHITECTURE, SOUTH KENSINGTON.—The Committee of Council on Education, having appointed Dr. Woolley as Inspector and Director of Studies, and Mr. C. Merrifield as Principal; they have also named as Vice-Principal Mr. Purkiss, the Senior Wrangler and First Smith's Prizeman in the present year.

DISCOVERY OF A PAGAN SEPULCHRE.—An interesting discovery has been made in a private garden at Luben, in Prussia,—a place of Pagan burial has been opened up, and many curious relics brought to light. A number of funereal urns, ornamented with circles in various colours, were found to contain some bones and a large quantity of dust; other and smaller urns contain the bones of children. Beside these were found many household utensils, handles of swords or other arms, articles of glass, a broken statue of a divinity in clay, and a large number of bones of various kinds of animals. The urns were surrounded by large rough stones, and were placed separately in a bed of marshy soil, with their mouths turned towards the east. It appears that in past times the garden was washed by a lake which reached to the Chateau of Luben. The excavations are being continued, and the objects found are placed in the Museum at Breslau.

EGGS.—In the French agricultural paper called *Le Bélier*, the following method is given for preserving eggs:—Dissolve in two-thirds of warm olive oil one-third of beeswax, and cover each egg completely with a thin layer of this *pomade* with the end of the finger. The egg-shell by degrees absorbs the oil, and each of its pores becomes filled with the wax, which hermetically seals them. M. Burnouf affirms that he has eaten eggs kept two years in this manner in a place not exposed to too great extremes of temperature. He thinks also that the germ may in this manner be preserved for a considerable time.

Patents.

From Commissioners of Patents Journal, September 16th.

GRANTS OF PROVISIONAL PROTECTION.

Air, &c., rendering substances less pervious to—2137—J. Stenhouse.
Bells, sounding alarm or signal—2147—J. H. Johnson.
Chimneys, machine for sweeping—2099—N. J. Peton.
Fibrous substances, flyers employed in roving, slubbing, &c.—2163—J. Ivers and T. Ogden.
Lamps, wick holders for—1271—H. Defries.
Lint, manufacture of—2081—D. S. Brown.
Liquids and fluids, apparatus for heating and evaporating—2088—A. A. L. P. Cochrane.
Malting, arrangements for—2177—D. Walker.
Metal pipes, means of making the joints tight—2161—R. A. Brooman.
Nails, manufacture of—2169—A. V. Newton.
Ordnance and projectiles—2159—P. M. Parsons.
Overcoat—2070—W. E. Gedge.
Paintings, &c., glazing and varnishing—2143—A. Rollason.
Paper, &c., applying liquid adhesive material, colour, &c., to—2132—A. Smith.
Photographic prints, apparatus for washing—2079—J. E. Grisdale.
Railways, prevention of collisions, &c.—2130—W. Clark.
Railway trains, communication between passengers and guard—2075—T. Wray and R. Robinson.
Railway trains, communication between passengers and guard—2151—J. S. Guy.
Reaping and mowing machines—2187—W. A. Hunter.
Reaping machines—2006—W. Brenton.
Rolling mills—2036—W. Yule.
Sewing machines—2090—J. M. Steinbach.
Sewing machines, construction of—2173—M. A. F. Mennons.
Ships of war and batteries, &c.—2067—J. Walker.
Slubbing frames, &c., roving intermediate—2183—J. Bullough.
Tube sheets, expanding tubes in—2171—E. R. and S. Lloyd.
Watch protector—2185—E. Burgess.
Water closets, &c.—2069—H. Wilson.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Files, cutting of—2221—E. O. Potter.

PATENTS SEALED.

667. G. H. Openshaw.
671. W. S. Longridge.
675. E. T. Wakefield.
676. J. Laverty.
678. R. Howarth.
680. W. A. von Kanig.
681. H. Wood.
682. D. Dalglish.
688. J. Edmondson and T. Ingram.
689. T. Gamble and E. Ellis.
690. L. A. Durrieu.
691. B. Fowler, jun.
694. G. F. Chantrell and J. Reymond.
696. J. Burrell.
699. C. Heywood.
705. J. H. Albinson and J. Collier.
706. W. A. Martin & E. Wylam.
710. P. Berghaus.
711. J. Reilly.
712. F. T. Moison.
714. C. Hill.
717. J. McMorran.
718. J. Bennie, jun.
719. J. Lawson & J. Lawson, jun.
721. J. Leslie.
724. S. Berrisford and W. Ainsworth.
726. D. H. Barber.
727. J. Edis.
730. F. Tolhausen.
733. W. E. Winby and W. Wharton.
734. W. Routledge and F. F. Ommanney.
736. T. H. Head and H. Smith.
737. J. Strafford.
739. F. Tyerman.
749. A. Blouin & N. D. Mercier.
770. M. Henry.
815. W. E. Newton.
865. J. F. Sharp.
896. J. Dodge.
966. G. Haseltine.
991. W. E. Newton.
1061. S. Bateman.
1240. J. Fletcher.
1446. J. Foxley.
1625. T. Duffy.
1777. J. Weeks.
1786. J. Clayton.
1788. T. F. Hodge.
1801. A. Dalzell.

From Commissioners of Patents Journal, September 20th.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2279. R. A. Brooman.
2312. F. M. and E. L. Ransome.
2313. W. Tuxford.
2332. J. Gurman.
2345. S. Hawksworth.
2360. G. T. Bousfield.
2273. W. Farlar.
2358. G. T. Bousfield.
2340. W. Clark.
2301. M. Rae.
2316. F. Barnett.
2335. J. C. Coombe & J. Wright.
2339. E. Breffit.
2342. J. H. Wilson.
2367. W. Tongue.
2395. A. V. Newton.
2422. J. A. Knight.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2414. W. Smith.
2422. S. Faulkner.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, SEPTEMBER 30, 1864. [No. 619. Vol. XII.

TABLE OF CONTENTS.

Proceedings of the Society.

EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Concluded from page* 705.)

FREE-HAND DRAWING.

THREE HOURS ALLOWED.

Candidates are not required to attempt all the subjects given in this paper, but may select those which are most in accordance with their art education.

Make a life-size drawing from the head of the model.
Draw one of the hands the size of life.
Make an outline of the whole figure eighteen inches high.
Design a pattern for a picture frame.
Make an original composition of Wrestling.

Directions for the Local Boards.

Let an old man or a boy be placed in an easy attitude before the candidates as a model for them to draw from.

GEOMETRICAL DRAWING.

THREE HOURS ALLOWED.

The constructions must be accurate, and show clearly, by plain and dotted lines, with appropriate letters of reference, the principles on which they are based. They may be put in ink, or left in pencil, at the discretion of the candidate, provided they are distinct.

No deviations from the conditions of the questions can be admitted; and since no candidate must answer more than two questions from any one section, he is advised not to attempt more than the time will admit of his completing, since little or no credit will be given for incompleted or inaccurate answers.

I.

1. Describe a circle of 1 inch radius, *inscribe* and *circumscribe* two equilateral triangles, having the *opposite* sides parallel.

2. Draw a square of 2·5 inches side, and inscribe six others in succession, each having its corners in the middle of the sides of the preceding one: verify the construction by drawing the four diagonals common to the successive squares.

3. Draw two equal squares of 4 inches side, having a common centre, the sides of the one being parallel to the diagonals of the other: complete the eight small squares having for one of their diagonals the middle segment of each side of the larger squares.

4. Draw a quadrant of a circle of 2 inches radius with a tangent parallel to either radius, divide the quadrant into six equal arcs, and draw radii through the points of division, produced to meet the tangent; measure and write down the lengths of four of the intercepted segments from the point of contact of the tangent.

II.

1. Construct a triangle with its sides 3, 4, 5 inches, and draw the inscribed and circumscribed circles.

2. Make a square or an equilateral triangle equal to the above triangle.

3. Determine by construction the longest side of a triangle similar to that of No. 1, but of three-quarters its area.

4. A line 3·85 inches long is to be divided into two segments, so that the area of the rectangle contained by them may be three inches.

III.

1. Draw the curve called an "oval" made up of arcs of circles described with different radii, longest and shortest diameters being 3 and 2 inches.

2. Draw the curve traced by a point moving from the centre of a circle, so that the distance increases in the same ratio as the angle contained by a radius through the point, and any fixed radius.

3. Draw the curve traced by the end of a string gradually unwound from the circumference of a circle of 1·5 inches radius.

IV.

1. Three lines, 3 inches long, meet in a point, each is at right angles to the other two, and two of them are inclined at 30° and 50° to the paper; represent these lines in plan and elevation.

2. An equilateral triangle of 2·5 inches side rests with one corner on the paper, the other two 1 and 2 inches above it: show it in a plan and elevation.

3. The plane of a square of 2·5 inches side is inclined to the paper at 60°, and two corners of the square are 1 and 2 inches above the paper: show it by a plan and elevation.

V.

1. A prism 5 inches long, its base a hexagon of 1·5 inches side, is cut obliquely by a plane inclined at 70° to one face and cutting off 2 inches in length of that face. Show the remainder by a plan and elevation:—

a. In any position at pleasure, or
b. When lying horizontally on its longest face.

2. Draw the real form of the section made by the oblique plane.

3. Draw the figure which if cut out and properly folded would form the prism thus shortened.

4. A square prism 4 inches long and 1·5 inches side is ended, by a pyramid 2·5 inches high with the same base. Show this solid by a plan and elevation when its edges are vertical and one face is inclined at 30° to the plane of elevation. Or,

5. When one face of the *pyramid* lies on the paper.

6. Draw the figure which if cut out and properly folded would form this solid.

VI.

1. An oblique cone 3·5 inches high, radius of base 1 inch, the apex being vertically over a point in the circumference of base: draw a plan and elevation when lying on any side, provided it is not the shortest.

2. Determine the plane which would cut this cone in a circle of ·75 inches radius.

3. Draw the figure which if cut out and rolled up would form the surface of this cone.

4. Three spheres of 1, ·75, ·5 inch radii lie on the paper, each touching the other two; determine a line in which a plane touching all three would cut the paper.

VII.

1. A block of wood 5 inches long, 3 wide, and 2 inches thick, with all its corners cut off at ·75 inches along each, as to be represented—

1. In Isometrical projection, or
2. In Perspective projection, the plane and distance of the picture, and position of the block being taken at pleasure, provided no face is parallel to the plane.

2. A cylinder, 1 inch radius and 4 inches long, is to be shown—

1. In Isometrical projection, or
2. In Perspective projection, with the same conditions as before.

THEORY OF MUSICAL GRAMMAR.

I. Rudiments of Musical Grammar.

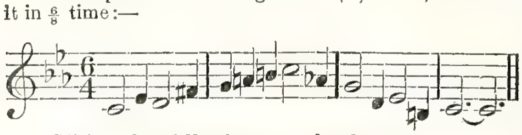
(*Nos.* 1 *to* 6 *must be answered* on music paper, *and in the order of the questions.*)

1. Write the scales of *Mi* (E) and of *Mi* flat (E flat), with the essential sharp or flat before each note.

2. Write the scales of *Si* (B) and of *Do* (C) *minor*, in every form with which you are acquainted.

3. Write *Sol* (G) and the minor third above it, *La* (A) and the tritone above it, and *Si* (B) and the imperfect fifth above it.

4. Transpose the following into *Si* (B) minor, and write it in $\frac{6}{8}$ time:—



5. Write the following on the bass stave, at the same pitch:—

6. Write a bar or two in every kind of time with which you are acquainted.

7. What is a musical *phrase?*

8. What is a chromatic interval?

II. Harmony, Counterpoint, and Musical History.

1. Which are the *fundamentals* of a scale or key?

2. How does a fundamental discord differ from a discord by suspension?

3. When are two following combinations said to be *connected?* Give examples of two connected and of two unconnected combinations.

4. State anything you know about English music in the seventeenth century.

5. Add three parts to the following:—

6. Add a part, or any number of parts, in any species of counterpoint, above or below the following:—

7. Harmonise the following.—

8. Divide the following into bars, so that it will form a connected melody. *Group* the quavers.

Proceedings of Institutions.

Metropolitan Association for Promoting the Education of Adults.—The Programme of the Examinations, to be conducted by this Association in 1865, has just been issued. An Examination in Plain Needlework will be held on Saturday, March 4, 1865, for the female members of the institutions in union. The Examinations in Elementary Knowledge, being the previous Examinations required by the Society of Arts, will be held in March. Her Royal Highness the Princess of Wales, the Patroness of the Association, has been graciously pleased to intimate her intention to give annually a Bible of the value of three guineas, together with two guineas in money, as a Prize to the Female Candidate who obtains a Certificate of Proficiency in Plain Needlework, and the highest marks in the Examinations in Elementary Knowledge, Higher Grade. The Special Examination in Religious Knowledge, established by the Asssociation for the Members and Students of Classes in Institutions and Schools in Union with it, is annually held, under the superintendence of its Local Boards, and the Certificates and Prizes are awarded by the Examiners appointed by the Lord Bishops of London and Winchester. Candidates for these Examinations must be at least twelve years of age, and must have

previously received from this Association, or from a Local Board connected therewith, or with the Society of Arts, a Certificate or "Pass" for proficiency in Reading, Writing, Simple Arithmetic, and Spelling. Candidates of the Higher Grade will receive a certificate signed by the bishop of the diocese. Candidates of the Lower Grade will receive a certificate signed on his behalf, and by his authority, by his chaplain. In 1865 this Examination will be held on April 11th. The Short-hand Examination is fixed for May 9th. The Committee, recognising the great importance to the working classes of a practical knowledge of Domestic Economy and the Laws of Health, have suggested a course of study in these subjects, and announce their intention to hold an Examination on May 16th. This Examination is intended to be preparatory to the Final Examination in Domestic Economy by the Society of Arts; the questions to be proposed by the Examiner appointed by the Association will be simple and practical. To be entitled to Certificates, the Female Candidates will not be required to obtain more than two-thirds of the number of marks required of the Male Candidates. The Examination papers will also contain a sufficient number of questions within the range of study particularly adapted to females, so as to enable them to obtain Certificates apart from a knowledge of those subjects specially within the competency of males. The following subjects are included in the Syllabus:—Such familiar notions of the rudiments of Science as are necessary for understanding the laws of health and the principles of common domestic processes; for appreciating the relative value of household articles in common use; and for detecting defective quality, adulteration, or fraud. The essential characteristics of a healthy and comfortable dwelling, as exemplified by some of the improved dwellings recently provided in the Metropolitan District. Useful knowledge concerning building materials, fittings, and furniture. Fabrics and Clothing. Adaptation of dress to weather, occupation, and means; effects of tight clothing. Elementary information concerning the food resources supplied by the animal and vegetable kingdoms; their judicious selection, preparation, &c. Use and abuse of condiments, beverages, &c. Household stores, and appliances for warming, lighting, cleaning, ventilation, and the prevention of noxious influences. Simple rules for the preservation and restoration of health; for the comfort of the sick; for safety from accidents; and for relief in cases of sudden injury. The use of weights and measures, and the keeping of household accounts. Easy instruction concerning Savings Banks, Provident Societies, &c. Prizes to the amount of Twelve Pounds are offered, through this Association, by the Committee of the Ladies' Sanitary Association, and will be selected by the successful Candidates from a list of books sanctioned by the Committee. A course of six lectures on the subjects named in the Syllabus, illustrated with diagrams, specimens, &c., from the Economic Museum at Twickenham, kindly lent by Mr. T. Twining, will be delivered at various Institutions in Union with this Association, by lecturers engaged by the Ladies' Sanitary Association. The Local Boards will also conduct the Final Examinations of the Society of Arts, in conformity with the regulations laid down by the Council.

ON THE FIRE-PROOF CONSTRUCTION OF DWELLINGS.

By Henry M. Eyton, Esq., Architect.

In the report addressed to the Council of the Society of Arts, entitled "The Statistics of Model Dwellings,"* one of the heads on which further information was considered desirable, was Fire-proof Construction, its best examples and their cost.

With the view of adding some little information under the above head, I have noted down some of the many fire-proof inventions, in the hope that in the valuable researches that are now being made by men of ability into the best means of improving the condition of the poorer classes of the population through the salubrity and cheerfulness of their dwellings, the increased danger necessarily attending the aggregation of several families under one roof may claim that share of their attentive consideration which is commensurate with its importance, as most of the improved buildings are now erected with wooden joists and floors, and some with even wood stairs, built, as stated in an article of the *Builder* of June 7, 1845, and again, November 4, 1848, "as if to burn." "Houses so arranged that if once on fire there is little chance of staying its progress; being, in fact, a mere bundle of sticks piled up;" and also, quoting from a pamphlet written in 1775, "that among a society of men so sensible, so learned, and ingenious, there never was a single idea or the plan of an hour's thought adapted to secure the building or family, who were continually surrounded by and living in the middle of combustible wood, from falling a sacrifice to the most trifling accidents of fire, which building and family lieth every night in the year at the mercy of a drunken fellow with the snuff of a candle, a handful of shavings lying in a bye corner, a little thoughtless boy and girl, or a sleepy servant-maid drying linen at the kitchen fire, besides many malicious accidents, to be entirely burnt down and consumed before the morning. Many people wonder that a strong built house should be so easily consumed, but this wonder ceases when they consider that everything about us is liable to catch fire; our houses are floored, our rooms partitioned, and the roof covered, with fir, a wood full of turpentine, and enriched with two or three coats of painting in oil, besides all our furniture, naturally made of wood, without the least material or contrivance to check the fury of fire, or prevent its rapid progress."

The Building Act merely deals with "Dwelling-houses for separate families containing more than 125,000 cubic feet," which it compels to have fire-proof stairs and landings, and with rooms tenanted by different persons if contained in a building exceeding three thousand six hundred square feet in area, where they are to be divided so far as they adjoin vertically by party walls, and so far as they adjoin horizontally by party arches or fire-proof floors; and although large buildings can be erected without either fire-proof stairs or floors, yet even these two sections are avoided by erecting one building in separate blocks, as was done by Mr. Gibbs, near Victoria-street, and by Alderman Waterlow, in Finsbury. In both of these buildings wood joists and floors have been employed. In all the buildings erected by the Labourers' Friend Society under Mr. Henry Roberts's superintendence, hollow brick arch floors have been used; and in the Portpool-lane buildings this plan has been put to a severe test, as will be seen by the following extract from the *Builder*:—

"Few of the large fires which have lately happened in the metropolis have been so extensively and rapidly destructive as that which has occurred in Portpool-lane, and an examination of the ruins shows the great danger which there is in keeping such immense stores of combustible materials in the centre of a dense population as are often found.

"Nothing could be more complete than the destruction which in a very short time took place over a large area. On the west side of the area of the fire are the "Thanksgiving" Model Lodging Houses; on the north, Reid and Co.'s immense brewery; on the south are closely-packed ranges of poor dwellings, every room of which is thickly inhabited; on the east there are houses of a similar class. Fortunately, on all sides, except that on which the model houses stand, there was a considerable extent of walls, without openings, exposed to the raging of the fire.

"The Portpool-lane model buildings are fire-proof. The rooms are arched with brickwork; the stairs and railings of slate, stone, and iron; the window-frames were

* *Journal*, Vol. XII., p. 91.

of wood, but these the firemen cut away with their axes. The roof has been partly burnt, and if this building had been constructed on the usual plan, there is little doubt but that it would have been destroyed, for the flames rushed in at the windows, and swept along the ceilings of the rooms. The inmates have been put to inconvenience, but their furniture has not been injured by the fire. In other directions the poor people have suffered, and, what is much to be lamented, thirty-six joiners have lost their tools, which, we are told, on the average, were worth about £30 to each man. In this way £1,080 has been lost, and the calamity will deprive most of these men of the means of providing for their families, for we hear that few had thought of insuring the property on which themselves, wives, and children, so materially depended."

It must be universally admitted that to secure comparative immunity from fire in ordinary dwelling-houses is a great desideratum, where even the resident is afforded the security of party walls and parapets of fire-proof material, guarding him from the carelessness of a neighbour. Of how much more importance then must it be where no such security exists, with a neighbour above and a neighbour below, all under the same roof, divided by floor joists and boarding of timber, and in some cases with wood stairs. A fire in such a building must inevitably involve a whole number of families in one common disaster.

But not only for this chief reason, the security to life and limb, ought the dwellings of the poor to be rendered incombustible. They should all be sound proof, in order to avoid the annoyance of the noise made by children, and the heavy tramp of the adult over head, wearying and disquieting at all times, but becoming intolerable in time of sickness. The solid incombustible material which would form an effectual barrier against the progress of fire, from its nature is equally a non conductor of sound, and as perfectly isolates the tenant of one room from the rooms above and below him, as if he were living in an independent tenement.

Another, and not unimportant advantage, is secured by this method of construction. The floors are almost wet proof, and the upsetting of a tub of water does not affect the inmates below. A third advantage is, that all these constructions form no harbour for vermin.

Before proceeding to notice the several systems in existence, it will be well, for the sake of clearness, to classify the different modes of fire-proof construction under two heads, viz., brick, and concrete and iron. Commencing with brick, the most simple system is the half-brick arch. This has been employed at the model dwellings at Birkenhead. The arches were tied together with iron tiles, and abutted in the centre on an iron beam; the spaces between the upper surface of the arches and the spandril were filled in with concrete, on which flat tiles were imbedded. The arches were 7 feet span, with a rise of 7 inches, forming a thickness at the crown of 13 inches. The cost of this system would, including iron girders and tile floor, be about £5 per square; if boarded, and the underside made flat and lath and plastered, £7 10s. to £8.

Hollow Bricks.

Mr. H. Roberts, in erecting the model dwellings at Streatham-street and Portpool-lane, used hollow bricks slightly wedged-shaped, six inches deep, four inches wide at top, nine inches long, and one inch thick, the rise of the arches being three-quarters to one inch to a foot span, set in Portland cement in the proportion of one part of cement to two parts of sand, the bricks being wetted before use. The weight of the arch was 37 lbs. to the foot superficial, and when levelled up with concrete 70 lbs. Each arch formed the abutment to the other, except at the extremities, where they were tied in with seven-eight iron rods, secured to cast iron springers. Mr. Roberts gives the extra cost of the brick arches at 12s. per cent. on the contract of £7,370, which would be about £1 per tenement, or 5s. per square.

On an experiment as to the strength of these arches, it was found that one of 9 ft. 6 in. span, (calculating the greatest weight that could ever be placed on such a floor, if covered with people, at the rate of 120 lbs. per foot superficial), would bear safely four times the weight, and broke down with six times.

Further particulars as to these arches are given in the "Essay on Dwellings for the Labouring Classes," by Mr. Roberts.

Mr. Bunnett has also patented a system of hollow-brick floors, the bricks joggled at the sides, so that when laid and tied by iron rods, they lock together, each brick being in contact with, and supported by, the six adjoining bricks. This form of flooring has been used at the Grosvenor Hotel and the London and Brighton Railway Station, Pimlico, and can be inspected at Mr. Bunnett's Factory, at New-cross. Specimens and drawings can also be seen at the South Kensington Museum, 46m. and 57z., class Building Materials. Mr. Bunnett gives the cost as follows, ready for the reception of floor-boards and plastering to ceiling:—

	Per square of 100 feet superficial. £	s.	d.
18 × 13·6	4	0	4
16 × 13·0	3	18	8
15 × 12·6	3	18	6
14 × 10·0	4	4	8
12 × 12 0	3	8	6

Mr. Warren has also a system of flooring of hollow brick. Specimens may be seen at the South Kensington Museum, 45m. and 56z. class Building Materials.

Various other methods with brick and tile have been adopted; and for small spans flat tiles in cement, with iron bonds have been successfully employed, and flat arches of tiles are used in Italy and the South of France; but these require thick walls to resist the thrust of the arch. Anything out of the common way, however, is almost sure to be costly, on account of the difficulty of finding men to execute the work, and the care and trouble it gives the builder, who, consequently, charges a high rate, not knowing with certainty what it will cost him to execute.

Among the many systems of the combination of iron joists and concrete, I will commence with that most commonly employed.

Fox and Barrett's System.

The principle adopted in carrying out this system of flooring, is the substitution of wrought or rolled iron joists for the ordinary timber joists, placed about two feet apart, and filled in between with concrete on wood slips. The surface of the floor can either be furnished with the ordinary boarding, or with cement, tile, slate, stone, or other material; the ceiling can be either finished by plastering to the strips that support the concrete, or by fillets secured to the strips and lath-and-plastered. Any required degree of strength is obtained by increased depth of joists and concrete. This system is well known, having been in use for a number of years at most of the new banks, hospitals, hotels, railway stations, private houses, and many of the model dwellings.

The cost of the rolled iron joists is nearly as follows:—

	£	s.	d.	
8 feet bearing, about	2	0	0	per square.
10 ,, ,,	2	10	0	,,
12 ,, ,,	3	5	0	,,
14 ,, ,,	4	0	0	,,
16 ,, ,,	4	18	0	,,
18 ,, ,,	5	10	0	,,
20 ,, ,,	6	8	0	,,

and from £3 to £4 10s. extra can be reckoned for the floor and ceiling, depending upon the kind of finish adopted. Mention having been made of the failure of this system at the Model Dwellings in New-street-mews, Dorset-square, in the report on the Statistics of Dwelling Improvements, on inquiries I find that the surface was

finished with Portland cement, which material has, on experience, been shown to be most unreliable for such purpose, but was unfortunately used in many of the earlier buildings constructed on this principle. Asphalte or lead being the only material now recommended for covering the roofs, care must be taken not to have the ceilings plastered before the concrete is thoroughly dry, or else the ceiling will shell off and give to the plastering much the same appearance as if mixed with sea sand. Models of the system can be seen at Mr. Twining's Economic Museum at Twickenham, and at the South Kensington Museum (not numbered). The flooring of the Picture Galleries there is also constructed on this system.

BEARDMORE'S SYSTEM.

This floor is constructed of vertical plates of sheet iron, with angle-iron rivetted through at the top and bottom. These beams are then placed on the walls, about 2ft. 6in. apart, and plates are rivetted to the bottom angle-irons and the space between filled in with concrete or earthen pipes and concrete. This form of construction was evolved by various experiments made by Mr. Fairbairn and Mr. Hodgkinson (reported in *The Builder*, Vol. vii., page 104), who determined that the uniform presence of concrete against the whole surface of the web and under the top flanges of the beam would produce the effect of a continuous strut, and thus enable comparatively thin plates to assume the true character of a beam or girder. Mr. Beardmore informs me that he never took any steps to prosecute his patent, on account of his professional engagements, consequently I am not aware if it has been employed at any buildings. For large spans it offers great strength: the cost for 14 feet spans would be about £5 per square for the iron, and from £3 to £4 10s. extra for the floor and ceiling. If placed two feet apart, with wood strips, as in Fox and Barrett's system, the cost would be reduced to £3 10s. per square for the iron—the weight of each beam being about 1¼ cwt.

NASMYTH'S PATENT.

This is similar to Fox and Barrett's, only, in lieu of wood strips, iron plates are bent into the form of a segment of a circle, supported on chord or tension bars, which have the ends bent upwards to retain the plates in their curved position when subjected to pressure.

CHEYNE'S PATENT

Is also similar to Fox and Barrett's, only, in lieu of wood strips, corrugated iron plates are bolted to the lower flange of the iron joists. Drawings of this patent may be seen at Mr. Twining's Economic Museum, at Twickenham.

THE FRENCH SYSTEMS.

M. Thuase and M. Creuzot employ rolled iron joists, of a slightly arched shape, placed at a distance of 3ft. 3in. from centre to centre, and connected at intervals of 3ft. 3in. throughout their length by ties of flat bar iron on edge, resting on the lower flange of the girder, and fastened one to another either by wrought-iron straps or cast-iron chairs; upon these ties are placed square bars, three between each pair of girders, running parallel to them from wall to wall, into which their ends are turned down and built in. On the iron frame-work the thick plaster ceiling is formed by a wood platform being placed under, whilst the plaster is thrown from above, the former being removed after the latter has firmly set.

In another method the iron joists are strutted, at intervals of one foot, by square bars, resting on the flange, and having their ends turned up to the height of the web of the girder.

In a third method, the girders are tied together in pairs at 3 feet intervals by round iron bolts, nutted at each end. Small square bars are hung on to these tie-bars, three between each joist.

All these methods can be seen in model at the South Kensington Museum, 24, 25, and 26 J., Building Materials, as well as others by M. Bleuze, M. Zorès, and others, which are fully described in the catalogue, and in the *Builder*, Vol. xii., pp. 29, 95, and 150.

The following are the prices of M. Thuase's system:—

Bearings.	Depth of joist.	Depth of floor.	Weight per square.	Price of iron work.
ft. in. ft. in.	in.	in.	lbs.	£ s. d.
10 0 to 11 6	4	7⅛	370	2 19 5
11 6 to 13 0	4¾	7⅞	420	3 18 5
13 0 to 16 6	5½	8⅝	465	3 14 4
16 6 to 20 0	6¼	9½	510	4 1 9
20 0 to 23 0	7⅛	10¼	605	4 17 6

THE DENNETT ARCH.

This name is given to a material composed, in part, with either sulphate or carbonate of lime, together with broken calcined cinders, bricks, and other porous material, formed in a soft state, on centering, into arches of spans of from five to ten feet, and in spaces where larger spans are required the width is divided by girders of wrought or cast iron. The abutments against the wall may either be formed with a cant brick slightly projecting, or laid into the walls. The thickness at the crown is from 2½ to 3 inches, with a rise of about ¾ inch to the foot. The arch will either form a floor finished with a polished surface, or it may be left rough, and paved with tiles, or have a boarded floor. The underside of the arch may be coloured, or ceiling joists introduced to form a flat ceiling. The material is stated to have been in use for the last ten years in the Midland Counties with great success, and it has been used in buildings that have settled considerably, without in any way causing a flaw or crack in the arch. The advantages of this material are its cheapness, viz., 60s. to 70s. per square, little or no skilled labour being required, and its extreme thinness (about 3 inches) at the crown, consequently reducing the weight of the walls. Not being able to speak of this material from any experience of my own, I cannot do better than quote from a testimonial by Mr. G. G. Scott, who says:—"I have made use of Messrs. Dennett and Co.'s material for fireproof arching, and though I have, happily, had no practical experience of its efficiency against fire, I can bear witness to its strength and its extreme convenience of application. I have made use of it in positions in which I should have found it difficult to introduce any other fireproof material, and it has this advantage, that the arches constructed of it are so entirely in one mass that they cover the space like a compact shell or inverted basin, and are, consequently, almost wholly free from lateral pressure." A specimen of the arch can be seen at the South Kensington Museum (No. 47 M., Building Materials), five feet span, with a rise of 2¼ inches, 4¾ thick at the haunches, and 2½ at the crown. A similar specimen is stated to have carried a weight of five tons without injury.

MR. WATERLOW'S SYSTEM.

The floors to the landings and passages and the roof in Mr. Waterlow's buildings in Finsbury were composed of clinkers, culm, hard broken coke, and similar rough calcined substances in the proportion of four parts to one part of Portland cement, sufficient water being added to bring the composition to the consistency of ordinary mortar. Bars of three inches by half an inch iron, are stretched edgewise across the building, from front to back, at distances of two feet apart, and carried into the brickwork of the walls and crossed by half-inch iron rods two feet apart, forming a network of iron with a mesh of two feet. A temporary scaffolding is then placed beneath, and the material thrown in to a thickness of four inches; in the course of time the whole mass sets with sufficient hardness to allow of the removal of the scaffolding. Mr. Allen, the builder of the houses, states that the floors can be erected for about £5 per square. This construction is similar to the French system without their girders; and

taking into consideration that the iron would hardly carry its own weight, that all depends upon the concrete forming one homogeneous mass, and that should any fracture occur the whole would fall, I do not think it is to be recommended.

COMPARATIVE STATEMENTS OF THE FOREGOING DESCRIPTIONS OF FIREPROOF FLOORS, PER SQUARE OF 100 FEET SUPERFICIAL, FOR A SPAN OF 14 FEET.

	Thickness of Floors in inches.	Cost. £	s.	d.
Wood joists, inch boards, and lath and plastered	11	4	8	6
Same if pugged	—	5	8	6
Brick arch, 4½-in. thick iron girder, use of centreing, and levelled up for tiles	13 & 20	4	15	0
Same if boarded, and the underside levelled, and lath plastered	24	7	0	0
Hollow brick arches. Cost depends upon the price of bricks, which would have to be made specially.				
Fox and Barrett's, with a cement surface	9	5	18	0
Same if boarded	11	7	3	0
Beardmore's boarded surface	11	8	5	0
French systems, about the same as Fox and Barrett's.				
Dennett arch	13 & 3	3	10	0
If tiled	14 & 4	5	0	0
If boarded, and the undersides levelled and plastered	15	7	10	0

The thickness of the floor ought to be taken into consideration, as it increases or diminishes the height of the building. For instance, a building of five stories with brick arches and boarded floor, would require the building to be 5ft. 5in. higher than another with Fox and Barrett's system, which, in a building of the size of the Streatham-street Model Lodging Houses, would be about 12 rods, or about £144.

BRITISH ASSOCIATION, BATH, 1864.

UTILISATION OF SEWAGE.

The following paper, by Dr. Henry Bird, was read in the Chemical Section:—

To utilize the contents of the sewers, and to restore to the land nitrogenous and inorganic principles which are abstracted from it in the growth of crops for the food-supply of man and animals, is one of the most important questions of the day. Some laborious investigations by Parliamentary Committees and Government Commissions have indeed shown that many of the methods hitherto proposed for this object are not sufficiently remunerative to stimulate commercial enterprise in the application of sewage to the soil; but they have at the same time established the fact that an enormous amount of natural wealth is being constantly dissipated, and finally lost to the country. Nor is this extravagance the worst feature of the case; for the continual abstraction of valuable inorganic matters from the soil steadily impoverishes it, rendering it yearly less able to maintain the life and vigour of an increasing population, and gradually, though surely, turning a fertile country into an unproductive desert. Even, therefore, at some temporary sacrifice, to redeem these valuable materials and apply them to their obvious and natural destination would ultimately prove highly advantageous to every district of the kingdom. The benefit of such a measure would not be limited to the production of food. The same works which would secure the utilization of sewage, would protect rivers and watercourses from that defilement and injury which are now progressing *pari passu* with the advance of town drainage and the extension of chemical works, and which, if uncontrolled, must at no distant period destroy all our fresh-water fish, obstruct the channels of rivers by indurated deposits, and render river water wholly unfit for domestic use and human consumption. This too, at a time when, owing to the clearance of forest and wood lands, and agricultural improvements generally, the available supply of water from springs is rapidly diminishing, and becoming quite insufficient in many places for the wants of the people. Not less important is the sanitary aspect of the question. So much information has been obtained and circulated on this subject that it is almost needless to remind this Association that many diseases are called into activity by foul accumulations in drains and ditches, and by the contamination of running water with the excreta of populous districts. Experience has shown that all diseases are aggravated, and especially that epidemics and pestilences extend and become more fatal in communities and families which breathe impure air and drink foul water. Blood poisoning is a common result of poisoned air and water. It is under such circumstances and conditions of atmosphere and water supply, that scarlatina, typhoid, or intestinal fever and cholera break out, spread, and destroy. The subject is, therefore, one of deep interest to all persons concerned in the management of the sick poor; and who is not so concerned? Thus, on sanitary as well as on economical grounds, the right use of sewage is inseparable from the public safety, and essential to the public prosperity. In this matter, however, legislation is indispensable. The most fanatical advocates of voluntary action and personal liberty will hardly venture to assert that the difficulty of the case can be met by individual effort. When this fails, in any such public emergency, the municipal authority, the magistracy, or the national government must act, or the whole population must suffer. Parliament should, therefore, be asked to facilitate the extension of sewage works in the neighbourhood of towns and villages, in order to distribute and apply their excreta to the surrounding land, by irrigation, and by other means; and at the same time to prevent, by stringent enactments, the fouling of rivers and brooks by sewage and other town refuse. The plan now to be submitted to your consideration has never been tried on a large scale, but it has been tested by a limited experiment, and has been found to answer the purpose satisfactorily. It is founded upon the physical properties of sewage, and on a few well-known chemical and mechanical principles. The following series of propositions and axioms embodies these principles and the leading features of my plan. 1. Sewage flowing slowly through pools, or tanks, or confined in vessels separated into three portions, the floating, the precipitated, and the intermediate fluid. 2. The process of precipitation may be produced by the use of cheap, simple, and easily procurable deodorants, to be hereafter specified. 3. Sewage, from the nature of its composition, rapidly undergoes putrefaction, which injures its fertilizing qualities, and causes deleterious and offensive emanations. The same fermentation may be produced by allowing fresh sewage to filter through masses of old sewage in tanks, drains, and more rapidly in large sewers. 4. This process of decomposition may be arrested, and its injurious results prevented by removing the more solid matters of the sewage, and drying them at a low temperature with antiseptic chemicals. 5. In the decomposition of sewage, ammonia and other volatile compounds are evolved, and are soon dissipated and lost. If old sewage be dried by simple exposure, it will be found to possess but a low fertilizing power, but, if dried with sulphuric acid, the ammonia becomes fixed, decomposition is arrested, and the fertilizing principles are retained. 6. The ashes, sweepings, and other refuse of large towns may be rendered available in the fertilization of poor land by percolating fluid sewage through them, for two or three weeks, and drying the mass with sulphuric acid; this compost may with little trouble or expense be made worth at least ten shillings per ton. 7. All manures prepared from sewage should be kept dry and protected from sun,

heat, and rain. 8. Fluid sewage, however treated, contains in solution and suspension fertilizing salts and organic matters. The chemical composition of sewage is well known, and its varying quantities and qualities may be easily ascertained from published tables. It is, therefore, unnecessary to dwell upon this point. 9. Fluid sewage can in every case be used for the irrigation of land. It should never be allowed to flow into the sea, rivers, or brooks. 10. The more solid portions of sewage may be easily separated from the fluid by allowing the whole to flow slowly through tanks and culverts, fitted with sluices and tubes, to be constructed upon the plan of models now exhibited—the current being directed through the middle level without disturbing the surface or bottom of the tank. The separation would be accelerated by the use of sulphated clay. 11. Clay, especially the more ferruginous clay and sulphuric acid, mixed in the proportion of one part of the latter with nine parts of the former, in a dry state, forms a cheap and efficient precipitant for sewage; it acts at the same time as a deodorant. It does not in the slightest degree injure the manure, but, in fact, adds materially to its fertilizing quality. 12. In the tanks already mentioned, the floating matter should be daily skimmed off the surface of the fluid sewage, then placed in a reservoir, and treated with diluted sulphuric acid. The precipitated matters should be also removed as often as the divisions or spaces between the sluices and bottom of the tanks become filled, and treated in the same manner with sulphuric acid. These matters so prepared may be dried quickly, at a temperature not exceeding 150 degrees, by spreading the mass upon heated beds of fine ashes or clay, in covered sheds. When sufficiently dried, the compost should be crushed, to make it fit for drilling or spreading on land. 13. When the more solid portions of the sewage are thus intercepted by sluices or traps, and removed (as above directed) offensive emanations are materially lessened if not prevented, and the fluid portion passes tolerably clear out of the tanks. By this method, the fætor caused by the passage of fresh sewage through masses of semi-solid putrefying matter is altogether prevented. It deserves to be repeated—that in order to preserve the supernatant and precipitated portions of sewage the most efficient and economical antiseptic is sulphuric acid; for it fixes the ammonia, converts the vegetable matter into glucose, and checks fermentation; and all the resulting salts are known to be excellent manures for crops of clover, roots, &c. As before said, sewage which has been dried by simple exposure to the air possesses but very low manuring power, the ammonia and its carbonates having escaped. But when dried as above, with sulphuric acid, the nitrogenous principles and the phosphates are retained, unless the temperature be raised so high as to disengage fœtid gases and decompose the sulphate of ammonia. Another method of preparing sewage for agricultural use, after treating it with sulphuric acid, would be to distribute it among a number of cylindrical draining tiles, placed over a bed of coal ashes or clay. These pipes being filled, the fluid filters into the ashes or clay, and water also evaporates from the surface of the pipes. The process should be repeated, until the tiles are filled with solid residuum—which may then be removed for use. The irrigation of land with fluid sewage has been practised successfully and profitably in many places; but it is said to be sometimes attended with offensive smells perceived at some distance. This, as I have explained, is in consequence of an undue amount of the more solid matters being left to decompose upon the surface of the land; and the objection does not hold good when those matters have been separated (as before shown) from the liquid, before it is used for irrigation. But if, without that preliminary measure, the contents of sewers be mixed with ashes or porous earth, and exposed to the weather, the compost increases in temperature, and decomposes rapidly; the heat of the mass drives off the ammonia, and, after it has been washed with rain, it is hardly worth the expense of carriage. Again, the more solid matter of sewage may be readily indurated and dried, by mixing it with common plaster of Paris, a valuable mineral manure, which in no way lessens the fertilising properties of sewage. Indeed, the value of both is increased by combination. It only remains for me to exhibit the action of sulphated clay, both in its dry state and in solution, as also models for tanks, &c., and other means by which percolation through town rubbish may be advantageously effected. A solution of the sulphated ferruginous clay, which may be called "liquid sulphate of alumina, with sesqui-oxide of iron," was sent for analysis to that eminent authority, Professor Taylor, whose report is annexed. When this deodorant is required to purify house-drains and sewers, it should be applied at the very commencement of the drainage system, namely, in the waterclosets, sinks, cesspools (if any), and scullery traps, of every house communicating with the common sewer; half-an-ounce of the liquid, mixed with water, should be used on each occasion, once or twice a day, or more frequently, by means of the simple apparatus, a sketch of which is shown. It would prevent the disengagement of ammonia and sulphuretted hydrogen. It would precipitate the phosphoric acid of the phosphates. If it did not destroy the specific germs of certain infections—as those of scarlatina, or typhoid fever, &c.—it would doubtless check their progress, by removing some of the worse conditions under which they multiply and spread. Once more; land may be irrigated with fluid sewage by sub-soil or underground channels. Drains may be made from nine inches to two feet in depth, either of turf or of drain-pipes, or squares nearly on a level, keeping, however, the outlet of each drain below the inlet. The surface soil would thus be saturated with sewage, without the production of noxious smells, or disturbance of crops, or interference with the cattle-grazing of the land. So much of the sewage as might ascend by capillary attraction through the nine inches of soil to the surface, would be perfectly deodorised, and a powerful manure would be applied directly to the roots of the crops, enriching the soil to a considerable depth. The economy—not to say profit—of these methods of utilising the sewage of towns will be obvious to anyone who will impartially investigate the proposed measures. And I venture to hope that these suggestions may lead to a series of experiments, under the auspices of this Association; experiments which, I doubt not, will convince the most sceptical that the present unjustifiable waste of valuable elements of food ought no longer to be permitted, either by the legislature, or by the local authorities of this kingdom. But, before we conclude, let it be distinctly understood that neither lime, sesqui-oxide of iron, alumina, nor any other deodorant, except sulphuric acid, should be used with sewage when the fluid parts are intended for irrigating land, for those bodies, with that one exception, take some valuable ingredient from the fluid. One part of sulphuric acid to 70,000 parts of sewage would be sufficient to maintain the fertilizing property of fluid sewage, until it had passed into the drains over or into the soil.

Appendix.—"Report of analysis of a deodorising liquid.—The liquid is of a pale brown colour, its specific gravity is 1·057, and it leaves on evaporation, 7·5 per cent. of dry mineral residue. Its principal constituents are sulphuric acid, alumina, and oxide of iron; it has a strong acid reaction. The following proportions were obtained by a quantitative analysis, the weights of each ingredient being calculated from an imperial pint of twenty fluid ounces of the solution:—Sulphuric acid (specific gravity 1·78), 454; alumina, 240; sesqui-oxide of iron, 168; total grains, 862. An imperial pint, therefore, contains two ounces (avoirdupois) of the mineral constituents. The admixture of this liquid in proper proportions with sewage, containing sulphide of ammonium, alkaline phosphates and carbonates, would produce a precipitate of alumina and oxide of iron. If sulphide of ammonium abounded, black

sulphide of iron and sulphur would in the first instance be precipitated. In reference to the phosphates, the phosphoric acid would also be thrown down with oxide of iron. At the same time the precipitated alumina would tend to purify the liquid by fixing and combining with suspended and dissolved impurities. The mixed deposits of alumina and oxide of iron thus containing the solid ingredients of sewage in an innocuous form, would be in a favourable condition to act as manure. The alkaline bases of the sewage including ammonia, would combine with the sulphuric acid, forming soluble sulphates in the clear liquid separated from the precipitate. The sulphate of ammonia thus produced would act as a good fertiliser of the soil. For the efficient action of this liquid as a deodoriser and precipitant, the sewage should be alkaline, or contain sufficient alkali (as carbonates) to neutralise the acid. A few acres of land arranged in tanks with sluices, &c., for the use of sulphated clay would be sufficient to precipitate the sewage of the largest towns and cities, even the metropolis, and render the fluid sewage clear and nearly inodorous, and still a powerful manure, containing in a gallon from four grains to twenty of sulphate of ammonia, &c. ; and the solid matters from the tanks or reservoirs, when slowly dried with one-third their quantity of earth or clay, will be found upon analysis to contain from one to two grains of phosphoric acid with other fertilizing salts and organic remains in every 15 pounds.

Dr. GILBERT said the question was how sewage was to be purified so that it might be sent into the rivers without damaging the water supply of the towns below; and, on the other hand, to what extent could it be rendered available for agricultural purposes. In one district in Edinburgh the fœcal matters from 300 to 350 persons went to an acre, and the amount of fluid sewage averaged from 20,000 to 25,000 tons per annum per acre. The question arose how much might these quantities be reduced with advantage, so as at the same time to get the sewage sufficiently purified to turn into the rivers. At Croydon he had obtained much information. There, about 250 acres were under irrigation. For six months the average showed that the water went two and a half times over the land, and was to a great extent purified. The sewage of Croydon he estimated would contain four grains of ammonia per gallon, including rain-fall, but exclusive of rain-fall six and a half grains. After the sewage had passed over the land it gave only two grains of ammonia, showing a great purification. So perfectly had the water been purified, that, although years ago proceedings had to be taken on account of the pollution of the river, now the people having the fishing were actually putting up grates to prevent the fish from going up the sewage drains. The purification was arrived at by the application of about 6,000 tons per acre, and experience might show that less would do. He thought that about 5,000 tons would be a very useful point to start from in the application of sewage on a large scale. But the great dispute now was, whether we should apply these large quantities to the succulent crops only, or to very large areas, and all crops. He might, in conclusion, read a short paragraph from a report which would shortly be published, as it expressed his views on the application of sewage to meadow lands:—"There is, of course, no question that, if the manurial constituents resulting from the consumption of the corn and meat sent into our towns could be returned to the land from whence they came, its produce would be considerably increased; for, with the mineral constituents there would always be associated nitrogen, in amount which would serve to render effective a considerable portion of all, if not the whole, of some of these constituents. If, however, human excretal matters continue to be diluted with water to the extent recognised by the growing system of urban defecation, and if dilute liquid sewage cannot be distributed in small quantities over large areas at a much lower cost to the farmer than has yet been proposed, there is little hope that the manurial constituents derived from the human food sent into our towns can be re-distributed over the area from which they came. Indeed, having regard to the inapplicability of dilute liquid sewage to arable land, except in small quantities, and in particular seasons, and to the estimated cost of distribution, it appears probable that the most profitable mode of utilisation will be to limit the area by applying the greater part, if not the whole, to permanent or other grasses laid down to take it the year round, trusting mainly to the periodically broken-up rye-grass land and to the application to arable land of the solid manure resulting from the consumption of the sewaged grass, for obtaining other produce than milk and meat by means of sewage."

Mr. TITE, M.P., said the question of sewage was one which had occupied his attention. As a member of the Metropolitan Board of Health the whole matter of the disposition of the London sewage had been before him for a considerable time. The London sewage was something enormous in quantity. It was collected in immense reservoirs, and then poured into the rivers at times when it would be swept out to sea. Thus the whole sewage of London, containing important chemical constituents, was utterly wasted. He had no doubt that they should relieve the basin of the Thames completely of the sewage which fell into it from Chelsea to below London, but, with regard to the utilisation of the sewage they did not see their way clearly, and on another point they were in a great difficulty. This point was, what was to become of the drainage of the large towns above their district, because it was impossible to join them with London, and it was idle to seek to drain Oxford by any lateral drainage that could reach the sea. At the present time Kingston had made arrangements to pour its sewage into the Thames, but was stopped by an injunction obtained by the conservators of the river, by which they had been taught that such nuisances could not be continued. The question then remained, what was to be done with it? Two facts had been proved. At Leicester, where the experiments had been carried on regardless of expense, it was proved that deodorising of sewage by lime would purify water, and prevent it becoming a nuisance to the stream. Since then it had been proved that fish flourished there, and the herbage and fruit, which before were poisoned, had now returned to their normal condition. This fact was also apparent, that the products which it had been thought would be sufficient to pay for these works had proved an entire failure; and, except for the lime used, which was very useful for the fertilisation of land, they had proved utterly useless. The other fact was the experiment at Croydon, which certainly did appear most successful. There the river formerly was polluted by the sewage. A farm of forty acres was then taken; ordinary drains were cut, the sewage was turned into the land before it passed into the river, thus purifying it of its offensive ingredients, and proving of great advantage to the land. Croydon had thus solved the problem extremely well; but how such a system could be applied to London was a problem still unsolved.

The Dean of YORK said he understood that in the Case of Croydon the sewage water was sent into the river in a comparatively pure state, so pure, indeed, that fish could live in it. He also understood that the sewage water there, though not exactly pure, was so to a great extent. Had any chemist made experiments as to what effect the drinking of such comparatively pure water would have on animal life?

Mr. TITE, M.P., believed that such experiments had not been made.

Professor WILLIAMSON drew attention to the fact that when cholera prevailed lately in this country its origin was believed to be traced, in many instances, to the fact that the sewage drained into the pump wells.

Professor BENNETT, of Edinburgh, observed that much importance had been attached to the question of deodoris-

ation, and smells were regarded not only as a nuisance but were supposed to be a cause of disease. He believed that the effect of smells as a cause of disease had been much exaggerated, and he instanced Montfaucon, near Paris, in proof of this. The sewage of Paris was taken to Montfaucon, was there allowed to dry in open pits, and it was found not to interfere with the health of the district, though the smell was certainly terrific. In Cologne and in Belgium, the sewage was utilised in a similar manner. The dried deposit of the sewage was reduced to powder, and as poudrette was conveyed to the land, where it proved a most valuable manure.

Mr. Tite, M.P., wished that the meeting should not be misled by the last speaker. In Paris, cesspools were still permitted; in London they had long ago been denounced as the great cause of fevers, and were no longer allowed.

Dr. Lloyd opposed the views expressed by Professor Bennett. It had been proved that the smell of sewage was noxious, and in the district near the river in Bath he had long noticed that amongst those who resided there, first came degradation, then ill-health, and then premature death.

Captain Galton said he knew numerous instances of disease from the state of the river Thames.

Mr. Rumney, of Manchester, said cesspools, as in Paris, were permitted in Manchester, and there was no evidence that fever or other diseases prevailed there to a greater extent than in other towns in the kingdom.

Mr. Thos. Webster confirmed the statement made by Mr. Rumney.

BRITISH PHARMACEUTICAL CONFERENCE.

At a recent meeting held at Bath, Mr. H. Deane, F.L.S., President, in the chair, the Report of the Committee on "Accidental Poisoning" was read by Mr. J. Raymond King.

After referring to the great interest which the subject of accidental poisoning had excited in the minds of members, the desirability of a thorough investigation of the question, with the object of preventing the recurrence of accidents, and the difficulties which beset the question, the report went on to state the course of proceeding adopted by the Committee in order to make the discussion of the subject interesting and practical. The Committee thought it advisable that their deductions and remarks should be based upon the results of statistical inquiry. They carefully examined the cases of accidental poisoning, as reported in the *Pharmaceutical Journal*, from July 1862 to June, 1864, inclusive. These are 25 in number, and may be thus summarised:—Ten cases in which the mistake was committed by the administrator; two by a surgeon, one by a wholesale house, one by a grocer's wife, and eleven by retail chemists or their assistants. The cases were elaborately detailed in the report; and after a careful examination of the merits of each, and an intimation that the Committee had corresponded with many gentlemen likely to form an opinion on the subject, the Committee came to the following conclusions:—

1. That there are seventeen out of the twenty-five cases in which there is every reason to believe that a thoroughly-effective poison-bottle would have prevented the accident.
2. That there are at least three cases in which, had the poison sold been folded in black paper, and labelled properly, the accident would not have occurred.
3. That 80 per cent. of the usual cases of accidental poisoning may be prevented by the use of proper precautions.
4. That only one of the 25 cases was the direct result of ignorance.

The practical suggestions and recommendations made by the committee may be thus summarised:—

1. That to all persons engaged in the practice of pharmacy, the facilities which exist for acquiring a theoretical as well as a practical knowledge of their business, render it incumbent upon them to do all in their power to make themselves thoroughly acquainted with their profession, in order to future safety and usefulness.
2. That a separate and suitable part of their shops or premises, be set apart for dispensing prescriptions wherever this has not already been done.
3. That in the dispensing department there be a repositorium toxicorum, or poison cupboard, with lock and key, in which should be kept all the concentrated and virulent poisons; or a small bottle of each, sufficient for present use, the bottles being filled from store bottles, which should be kept in another and larger store cupboard or room, as required.
4. That the labels upon all shop and store bottles be in future so placed that the whole of the label can be seen at a glance, on the plan introduced by Messrs. Ford and Shapland, of London, instead of writing round the bottles, as at present arranged.
5. That, wherever practicable, every prescription be checked by a second person before it is sent out.
6. That liniments, lotions, and all poisonous liquids be dispensed in bottles registered by Mr. Merrikin, of Bath, and called "Merrikin's Caution Bottles," as being in the opinion of the committee superior to any other bottles hitherto used for the purpose, and that the labels be printed in red ink.
7. That the more concentrated and potent poisons, such as strychnine, morphia, prussic acid, &c., should not be sold in an unmixed state, without a medical order, under any circumstances whatever.
8. That no poison be sold in a dangerous quantity by any assistant or apprentice without the express sanction of the principal.
9. That every poison, in addition to its name, be distinctly marked "Poison" before it is sent out, excepting medicine dispensed from a prescription where the statement of the dose or use of it may be considered sufficient.
10. That dry poisons, such as oxalic acid, sugar of lead, red and white precipitate, &c., be invariably folded in *black* paper, and in addition to the name of the article, that a label with the word "Poison" in bold white letters on a black ground be securely attached to each packet.

Fine Arts.

South Kensington Museum.—In accordance with the usual practice of the Museum in receiving valuable works on loan, a collection of choice oil paintings of the Dutch school, 56 in number, has been lent for exhibition by John Walter, Esq., M.P., and is now arranged on the walls of the gallery from which the Mulready pictures were lately removed. The collection consists of works by Berchem, Both, De Hooge, Du Jardin, Gonzales Coques, Hobbema, Maas, A. Ostade, T. Ostade, Paul Potter, Ruysdael, Van Stry, Weenix, and other celebrated masters.

Public Encouragement of Art. — Thirty-eight artists have received commissions in connection with the decoration of the new Church of the Trinity in Paris, the total amount to be expended in ornamentation being about £9,200.

M. Menissier, a distinguished painter, lost his life the other day by falling from a scaffold in the Church of Saules, where he was engaged in an important work.

M. Paul Balze is about to execute, in the porch of the new church, Saint-Augustin, in Paris, three pictures of Faith, Hope, and Charity, in what is called *peintures émaillées sur lave*, a new process said to be admirably adapted for decorative works.

Public Statues are about being erected at Laveur, to Count Las Cases; in Dauphiny, to the Chevalier Bayard; in Normandy, to Richard Lenoir, the famous self-made manufacturer; at Cognac, to François I.; in Corsica, to the Duc de Padoue; at Florence, to Dante; at Pesaro, to Rossini; and at Maeseyck, in Belgium, to the brothers Van Eyck. This last has been inaugurated with great ceremony, the whole of the royal family being present, and the sculptor, Leopold Wiener, being decorated by his Majesty with the Cross of Leopold.

Notre Dame.—The upper portion of the front of the north transept of this church has just been completed, and the magnificent rose window, entirely restored, is uncovered. This window is about forty-two feet in diameter, and its details are extremely graceful.

Statue Discovered at Rome.—There is much talk about the discovery of a colossal statue, in bronze gilt, at the depth of fifteen feet, in the Court of the Palace of Prince Pio, in the Place du Biscione, at Rome. On this spot stood originally the theatre named after Pompey, the first building of the kind in Rome built of stone. The palace had recently been purchased by M. Righetti, who, in order to enlarge it, caused some excavations to be made, when the workmen first found a thumb, and afterwards a very fine arm, evidently detached from a statue which must have measured twelve feet in height.

Annual Competition for Prizes, Paris.—The exhibition of the works of the pupils of the Paris School of Art competing for the grand prize of Rome has just taken place, with the remarkable exception of paintings. The omission of the last arose out of an unfortunate accident, under the new system: the awards were to be given by juries elected for the occasion, and not by the Academy, and in order to shut out all chances of canvassing, the members of the jury were appointed at the latest moment, but many of them were absent from Paris, and the consequence was that only two or three attended, and the adjudication of the prize in painting stands, in consequence, adjourned *sine die*. The subject for the competition in sculpture was, "Ulysses Bending the Bow;" and two of the models sent in are very clever works, but neither sufficiently remarkable to warrant the prize, which has therefore been divided between the two young sculptors, Delaplanche and Deschamps. The subject given to the architectural pupils was, "An Hospice on the Alps," and the results are a number of most elaborate drawings, some of them exhibiting much talent, but not one of them more valuable for architectural purposes than a theatrical scene of the great Saint-Bernard. In this case M. Guadet obtained the prize, with the acquiescence of the public, but no exhibition ever illustrated more fully the objection made by M. Viollet-le-Duc and other reformers to competitions in which the pupils are fixed to a given subject, and that subject a fantasy. The failure of the painting committee under the new system is a triumph for the academical party, but the exhibition adds another blow to the existing mode of education which fixes all the conditions beforehand, and ties intuitive genius or talent hand and foot. The world of art has had far too many "Ulysses bending his bow," and "Belshazzar" palaces perched on inaccessible mountains; it wants to see the individual capacities of artists evolved, for fear all architecture should resolve itself either into copies of this or that temple, on the one hand, or into the railway style on the other. The specimens of engraving were considered unworthy of the grand prize; the result is the failure of two out of three competitions, and the adjournment of the fourth.

Manufactures.

Butter.—The *Grocer* says:—At present, in many parts of England, much inconvenience is experienced from the scarcity of fresh butter. The profits on this article have of late years been greatly diminished, and substitutes have been much spoken of. It is worthy of remark that the districts most famous for butter supply the meanest quality of cheese. We hear much of Leicester cheese, but we are not aware that that county excels others in its butter supply. A vegetable butter, superior in richness to that produced from cow's milk, is obtained from the shea-tree, in Africa; and at home here the consumption of marmalade is greatly on the increase as a substitute. The average price of English butter, taking a series of years over a wide area in this country, is 1s. per pound; the present price, in most of our provincial markets, is 1s. 6d. per pound; but it has reached 2s. at Stamford. It appears from our last week's market news that at Carmarthen, notwithstanding the short supply, butter sold at 1s. 0½d. The scarcity has been felt in Ireland, but supplies are now increasing. Messrs. Lalor and Sons, of Dublin, in their last circular, report the weather as highly favourable for pastures, and large supplies with but a limited demand, at a decline of fully 1d. per pound on cools, and 4s. to 6s. per cwt. on firkins, and the market closing without any symptoms of recovery. The delivery from the sister kingdom last week was only 2,669, against 8,800 firkins in the corresponding week of last year. The imports, however, of foreign butter for the same week show a very large increase—20,052 against 12,521 firkins in 1863. By economy, and the introduction of substitutes, we may reasonably hope that the price of this useful article of diet will in course of time be lowered, though we fear it will never again compare with those of past years.

A Smoke-consuming Furnace.—There has for some time past been in operation at the engineering works of Messrs. Moreland, 3, Old-street, City, a furnace, invented by Mr. E. B. Wilson, which is said to economise fuel to a considerable extent, and to be almost smokeless. It consists of, at the back, a chamber or box to contain the fuel, and a reverberating oven connected therewith, the flue being at the other end of the oven, and connected with the ordinary chimney-stack. The coals are ignited in the box, to which they are supplied periodically—about two or three times a day. As there are no fire-bars in the furnace, the air enters upon the surface of the fresh coal in the box, causing a downward draft, as the floor of the reverberating oven slants downwards from the coal box. The gas is thus slowly and continuously distilled until it comes in contact with the lower strata of burning coals, when it receives its proper dose of caloric, and passes into the reverberating oven, heating any material that may be placed there, and passes away downwards by the flue which descends at a point a little inwards from the mouth of the oven. In the ordinary method of feeding a furnace with fresh coal, it is thrown on the top of that which is already ignited, and of course a large quantity is thrown off in smoke and is lost, thereby greatly impairing the heating quality of the furnace, as well as poisoning the atmosphere. In this furnace the gas, which is formed by the contact of the unconsumed coal, passes through the heated spaces, and is itself heated to the required temperature; it then passes through the reverberating oven, and heats there any material exposed to it, and the furnace may be so managed that scarcely any of this gas shall pass off in smoke, but will be nearly all consumed. Looking towards the front of the furnace, that is, the place at which the iron or other matters to be heated are inserted, the flames are observed coming towards—not, as in ordinary furnaces, flowing backwards from the spectator. In fact, the principle here adopted is simply that of turning a fire upside down, or a furnace back foremost, so that the fresh coal is applied at that end whence the smoke of its first ignition goes through the fire and is consumed, instead of being placed on the end of the fire, whence the direction of the draft carries it off as soon as evolved.

A New Gas Engine, or *gazomoteur*, the invention of M. Belon, has been introduced at the paper factory of M.

Anzin, near Paris, and has been favourably reported upon by the Academy of Sciences. It is stated that the machine possesses an economy equal to 60 or 70 per cent. It consists of three principal parts—an air-pump, a smoke-consuming furnace, and a motive cylinder. The furnace, when the engine is at work, remains closed, unless at the orifice by which the air-pump opens on it, and the one by which the heated air sets the cylinder in motion. It is so arranged that a quantity of combustible matter, equal to that which it consumes, falls constantly into it. A state of combustion is kept up by the air-pump. Part of the air passing from this rushes into the furnace, the rest combines with the coal-gas, forming thus a gaseous mixture, the volume of which is far greater than that of the air previous to its introduction to the furnace. This mixed air acts on the piston of the *cylindre moteur* with a force proportionate to the increased volume produced by the elevation of the temperature.

Commerce.

Paper Exports.—The quantity of paper for writing and printing purposes exported in the first seven months of this year was 65,586 cwt., against 62,822 cwt. in the corresponding period of 1863, and 49,383 cwt. in the corresponding period of 1862. The total exports to July 31 may be thus set down:—British India, 16,760 cwt., against 15,493 cwt. in 1863; Australia, 32,883 cwt., against 29,702 cwt. in 1863; and other countries, 15,943 cwt., against 17,627 cwt. in 1863. The exports of paper of other kinds (except hangings) amounted, to July 31, to 28,043 cwt., against 25,620 cwt. in the corresponding period of 1863, and 31,114 cwt. in the corresponding period of 1862. These latter exports were made up thus:—To British India, 1,826 cwt.; Australia, 14,772 cwt.; and other countries. 11,445 cwt. The total exports of paper of all kinds to July 31 this year were thus:—93,629 cwt., against 88,442 cwt. in the corresponding period of 1863, and 80,497 cwt. in the corresponding period of 1862. The value of the paper for writing and printing purposes exported to July 31 this year was £237,021, against £227,558 in the corresponding period of 1863, and £186,420 in the corresponding period of 1862. The value of the paper of other kinds (except hangings) exported to July 31 this year was £66,500, against £63,328 in the corresponding period of 1863, and £63,885 in the corresponding period of 1862. The aggregate value of the paper of all kinds exported to July 31 this year was therefore £303,521, against £298,886 in the corresponding period of 1863, and £250,305 in the corresponding period of 1862. Paper of all kinds was imported, to June 30 this year, to the value of £214,730, against £180,089 to the corresponding date of 1863, and £182,472 to the corresponding date of 1862. To these totals paper for writing and printing purposes contributed £165,005 this year, against £144,563, and £131,492 respectively.—The value of the imports of materials used in making paper amounted in the first five months of this year to £226,584, against £122,981 in the corresponding period of 1863, and £89,601 in the corresponding period of 1862.

Tea Cultivation in India.—A Calcutta paper states that the tea-planters in Assam and Cachar complain bitterly of the want of efficient control over their native labourers. There is little or no local labour in the tea districts, and workmen (or coolies) have to be brought from other parts, at a very great expense, under engagements to serve for a certain space of time. These engagements or contracts are frequently broken by the coolies, who desert the planter who engaged them, to go where they can get rather higher wages. The only present remedy lies in an action of civil law, which cannot be decided under such a lapse of time that crops may have been spoilt for want of labour; and if the case result in the planter's favour, the decision is of no use to him, as it only enables him to obtain damages from the coolie. Imprisonment is generally the alternative, as the debtor in most cases has no means of payment, and additional injury is thus entailed on the planter by prolonged loss of the time of his workman. The contempt of contracts in India some years ago ruined the trade in Indigo, and those who understand the country urge the necessity of severer measures, so that prompt punishment by criminal process might result from direct breach of faith. It is hoped that the Indian Government may be induced to pass a law sufficiently stringent to deal with this important subject, which otherwise threatens to bring ruin on many enterprising tea-planters.

Beetroot Crops in France.—A letter from Lille says that two months ago, from the extent of the cultivation and from the appearance of the beetroot, a crop of 200,000 tons was reckoned on; but the drought, which lasted till the 22nd of August, did great harm; and the tardy rains have only partially remedied the evil. Only 140,000 to 150,000 tons are now expected to be made, in either case about 40,000 tons more, and not less, than last year. The figures given below show the importance of the beetroot sugar industry in France during the last twelve years. The season lasts from the 1st September in one year to the 31st August in the next. The quantities are given in million kilogrammes:—

Seasons.	Mil. kilos.	Seasons.	Mil. kilos.	Seasons.	Mil. kilos.
1852–53	... 75	1857–58	... 151	1862–63	... 174
1853–54	... 77	1858–59	... 133		
1854–55	... 45	1859–60	... 126	1863–64	... 108
1855–56	... 92	1860–61	... 101		
1856–57	... 83	1861–62	... 146	1864–65	... —

Since 1864 the use of beetroot has been divided between the production of sugar and distilling; at present about two-thirds is used for sugar and one-third for distilling, that is to say, that if the crop had been good, and if it could all have been used to make sugar, there would have been produced this season 300,000 tons of sugar in France.

The Wool Trade.—In the public sales of East India wool, recently held at Liverpool, about 17,000 bales were brought forward. The opening prices showed an average decline of 2½d. per lb. on July rates, which soon increased to 5d. and 3½d. per lb. There was, however, throughout a good competition at the decline. The advanced rate of discount, the unsettled state of public opinion as regards the duration of the war in America, and the heavy decline in the value of cotton, have all had their influence in bringing about the fall in the wool market.

Colonies.

New Zealand.—The gross customs receipts, exclusive of gold duty, for the year ending 31st March last, amounted to £25,752 7s., of which the provincial treasurer has received £11,278 14s. 11d., being £1,278 14s. 11d. in excess of the estimate; and in addition to this the sum of £1,627 10s. 5d. has been received from the General Government as surplus revenue. The gold duty for the same period amounted to £1,028 2s. 2d. The land fund was estimated at £30,000, which, as about the average of nine years' previous receipts, might be supposed to be a reasonable conjecture. The amount actually received was, however, little more than half this estimate, being £15,127 net, and showed a sterling decrease of £44,267, or nearly seventy-five per cent. upon the receipts of the previous years—£59,394. The failure of the wheat crops this season over so large a portion of Australia—however ruinous it cannot but prove to many—will at least have the advantage of showing the farmers that it is dangerous to trust to one crop alone

for the year's production of their farms. The attention of farmers should certainly be called to a promising crop, and one which has never yet been tried in the colony—it is flax. One great advantage of a flax crop is the short time it occupies the ground—the proper time for sowing being the end of August, and it would be ready for pulling about Christmas. The length of time it remains in the ground depends much on whether the principal object of the grower is to obtain a fine and high-priced fibre, for which purpose it must be pulled before the seed is ripe, or whether he will be content with a fibre not quite so fine, but accompanied with the ripe and merchantable seed. In the one case the flax may be gathered two or three weeks sooner than the other. As a rotation crop flax is very valuable. It will thrive well after wheat and oats, and will require no manure. The only necessary condition is that the ground be well worked and friable at the time of sowing. It is an excellent crop with which to sow grass and clover. No doubt the present price of flax may be regarded as exceptionally high, owing to the price of cotton, consequent on the American war. Still it is by no means an unreasonable surmise that by the increased production of flax, and by the improvements in the machinery for preparing and manufacturing it, the civilised world might yet return to linen goods.

Productions of Otago.—A local paper reports that a discovery of quicksilver had been made at Hamilton's diggings there. Dr. Hector, the provincial geologist, reports that the mineral is in the form of cinnabar, which usually contains 86·2 per cent. of mercury and 13·8 of sulphur. The specimens submitted to him were tolerably pure. He adds that the discovery is valuable if the mineral exists in any quantity. The reduction of the ore is a simple process, not requiring much capital. It appears that the finances of the Otago Government are by no means in a flourishing condition. The treasurer, in a speech on the subject in the Provincial Council, said he had £70,000 to pay in the course of June, and only £30,000 to do it with, while the bank had absolutely declined to allow the overdraft to be increased. In this state of matters authority was given to the Ministry to sell unsurveyed as well as surveyed lands, a course which a portion of the press warmly opposed. The same journal states that a single escort recently brought to Dunedin no less than 13,108 ounces of gold, of which 4,285¾ ounces were from Queenstown, 2,116 ounces from Hamilton, and 1,872 ounces from Tuapeka.

Agriculture in California.—When it is remembered that but little more than a decade of years has elapsed since California was mainly dependent upon the Atlantic States and Chile for her breadstuffs, the subsequent advance made by that prolific state in the culture of cereals, as fully set forth by statistics in the San Francisco *Price Current*, is truly remarkable. Not only is she come to be self-sustaining in this particular, but her exports of flour and cereals to foreign countries far exceed the expectations even of enthusiasts. The following are the exports of wheat and flour from San Francisco to different countries for the fiscal year ending June 30th, 1864:—

	Wheat.	Flour.	Equal to brls. Flour.
	Sacks.	Barrels.	
To England	813,553	2,507	273,691
China	161,574	53,246	107,104
Japan	84	1,236	1,264
Australia	90,890	63,337	93,634
Victoria, V. I.	3,809	26,914	28,184
Hawaiian Islands	121	4,699	4,739
Mexico	15	11,943	11,948
Peru	260	—	87
New York and Boston	—	9	9
Other countries	986	20,211	20,539
Total	1,071,292	184,102	541,199

The opening of an export trade in agricultural products to China and Australia, to say nothing of other countries, promises important results to California. The trade has already attained large proportions, and bids fair to steadily increase. Had it not been for the high prices in San Francisco during last spring and early part of the summer, consequent upon the drought, and an apprehended scarcity for home consumption, the exports to Australia, Victoria, and China, would, it is stated, have been large; but the sudden rise in prices rendered it impracticable to execute many of the orders received, for the transportation of which vessels ballasted with coals were specially sent from England. At the latest dates the export movement was at a stand, and the *Price Current* states that parties there had ordered by telegraph shipments of flour and wheat from this port to China direct. The exports of barley and oats from California for the year ending June 30th were as follows:—

	Barley.	Oats.
	Sacks.	Sacks.
To Victoria	20,545	4,698
New York	841	—
Australia	8,082	80,849
China	200	4,133
Mexico	556	96
Hawaiian Islands	10	976
Japan	—	313
Other countries	36	25
Total	40,270	91,403

With regard to the surplus stocks in California, it is stated that flour had been sold up close to the production, while a handsome surplus of wheat was in the hands of the farmers, and held at about 3c. per lb. Barley was very low in stock, though there was said to be sufficient to supply the demand for brewing purposes. Last year's crop of oats was proportionately greater than any preceding year, and the surplus remaining is admitted to be very large. The *Price Current*, after a full view of the case, arrives at the conclusion that all grain crops for the current year will be quite ample for home use, notwithstanding the drought. From a comprehensive survey of the whole grain-growing districts of California, and a careful comparison of views with those best informed, by letter and otherwise, it feels warranted in estimating the wheat crop of that State for 1864 at 2,000,000 sacks of 100 lbs. each, or just one-half the estimated crop of 1862, which at 1 dol. 65c. per 100 lbs., yielded an aggregate of 6,000,000 dols.

Coal in Australia.—The official examiner of coal fields in the Illawarra district, to the South of Sydney, states that the southern coal is of a different character to the northern coal, yet the two have always been suspected to be of the same general formation. It has been often guessed that the northern coal-field dipped under Sydney, and reappeared at Wollongong. By a careful examination along the coast of the superimposed strata, the connection of the two coal-fields seems to have been established. The Wollongong coal seam, it appears, is not identical with any of those worked at Newcastle, but is a more elevated seam. If it ever existed at Newcastle, it has suffered denudation, and has disappeared. The lay of the Wollongong coal measures is traceable with tolerable clearness along the face of the sea cliff. The top seam vanishes below the water line, at a point about thirty-four miles south of Sydney. It has been identified as reappearing above the water at Tuggerah Beach to the north of Sydney, and about seven miles south of Lake Macquarie. The Tuggerah Beach coal (which has not been worked) lies next above the Lake Macquarie coal, and its identification with the Wollongong coal enables the section of the coal basin to be so far completed that the order of superposition between the Southern and Northern measures is determined. Two

other outlying coal measures are known to exist, one at Mittagong, further south than Wollongong, and one above Stroud, north of Newcastle. There are said to be twenty-six different seams of coal, averaging three feet in thickness, or containing altogether 157 feet in thickness of coal. The strata in which these seams are imbedded represents a depth of five thousand feet. These twenty-six seams do not form an exhaustive list of coal measures, but include only those which have been so far examined as to be placed in their order. The collocation of other known seams awaits further investigation.

Forthcoming Publications.

Shipbuilding, Theoretical and Practical. By Isaac Watts, Esq., C.B., W. J. M. Rankine, Esq., C.E., LL.D., F.R.S., Frederick K. Barnes, Esq., James Robert Napier, Esq., with contributions by eminent practical shipbuilders. Corresponding and general editor, W. J. Macquorn Rankine, C.E., LL.D., &c. (*William Mackenzie*).—This treatise will provide a complete system of information on the Art of Shipbuilding, and on the scientific principles on which it is founded. There is a growing interest felt in the education of British Naval Architects, and a strong desire that it should not fall short of what is now being accomplished in France. Hence one object of the work will be, to lay down the scientific principles of Naval Architecture in as plain and clear a manner as possible, for the benefit more especially of young students who may desire to be well grounded, in order that they may afterwards advance without hesitation in the prosecution of their honourable and useful profession. The work will extend to 400 pages, illustrated by extensive tables, more than 100 woodcuts, and by upwards of 30 large plates of ships and engines, taken from models whose excellence has been proved by their practical success. The following is a summary of the contents of the treatise:—1. *Hydraulics of Shipbuilding; or Buoyancy, Stability, Speed, and Design.*—This part explains the scientific principles which guide the Naval Architect in designing a ship, so that she shall possess the properties required of her, as to displacement, steadiness, and speed, in order that she may fulfil her practical object; and in computing the power which will be required to drive her at her intended speed, whether by sails or steam. 2. *Geometry of Shipbuilding; or Modelling, Drawing, and Laying-off.*—This part describes the methods by which the model and plans of an intended ship are constructed, and the figure and dimensions of her parts laid off. 3. *Strength of Materials as applied to Shipbuilding.*—This part sets forth the facts and principles known as to the strength of the materials of which ships are built, whether timber or iron, and the application of those facts and principles to practice. 4. *Practical Shipbuilding.*—This part describes the processes gone through in shaping and putting together the materials treated of in the preceding part, during the actual building of ships, together with their whole structure and fittings. 5. *Masts, Sails, and Rigging.*—This part treats of the principles of the propulsion of a ship by sails, and the structure of the parts which effect that propulsion. 6. *Marine Steam Engineering.*—This part sets forth the scientific principles of the propulsion of a ship by steam-power, and the practical rules which regulate the construction and working of her engines. 7. *Shipbuilding for Purposes of War.*—This part explains the principles and practice of the art of building and fortifying vessels of war of different kinds, and will be illustrated by plates of H.M.S. *Warrior*, engraved from copies of official drawings authorized by the Lords Commissioners of the Admiralty to be made for this work.

Notes.

Labourers' Cottages.—Mr. Disraeli, M.P., in a recent speech before the Buckinghamshire Agricultural Association, said:—"I consider it of the utmost importance that agricultural labourers should be well housed. In my opinion it is more important than a question of food or raiment. I believe we all eat quite enough, and many of us drink a great deal too much—but this I will venture to say, that no man can be too well housed. A perfect sanitary condition as regards habitations is one which, whilst it preserves and defends the inhabitant from the inclemency of the seasons, allows him to breathe and enjoy pure and unvitiated air. For these reasons it is the truest source of health and wealth. There are great difficulties in the way, and the first difficulty is that it is an investment for capital which does not bring us directly an adequate return. This is an objection which I consider fallacious. The point is what do you consider an adequate return? Ask the farmer whether he would like to have on his farm his labourers in healthy habitations, or living two or three miles from the acres which he cultivates, in miserable hovels which engender sickness and weaken their energy and strength. The farmer will say directly, 'Give me labourers who reside on my acres and who reside in houses which allow them to come to their labour full of energy and vigour—energy and vigour given by sound sleep and pure air.' The farm will then be more valuable to the tenant, and if so it must be in the long run more valuable to the proprietor, and this does tell upon the rent. In this way the landowner will find an adequate return for his investment. I do not say that this is an easy difficulty to combat. It is a great one, but it must be met. The question, however, is usually argued as if the proprietor was called upon suddenly to sweep away all the miserable tenements that he has inherited, and to cover his estate with model cottages. That is impossible, for you cannot in one instant effect this great change. You cannot unhouse the whole peasantry of an estate at once; it can only be done gradually. Take a model estate of 2,000 acres. On that estate you require a minimum of sixty cottages. The expenditure for erecting sixty cottages would probably be £6,000 or £7,000. I have seen the estimate for such an expenditure. Well, how is a man to expend £6,000 or £7,000, which is perhaps three times his rental, unless he has, which we have no right to suppose, other sources of capital? No one expects, because we have discovered a want in our social system, and a duty to perform, that it is to be done in a manner injurious to ourselves. You cannot expect every landed proprietor to be a Duke of Northumberland —a man whose mind is as extensive as his fortune, and who built cottages on 200,000 acres at an expense of some £500,000. Her Majesty conferred a ribbon on the Duke of Northumberland because he created a Channel fleet at the moment we had none; but the man who lays out £500,000 in building cottages on his estate as much deserves a blue ribbon as the man who creates a Channel fleet, or even at the head of a Channel fleet leads us on to victory. Every man cannot do what the Duke of Northumberland has done; but every man can do something. He may build a few cottages or repair others. You ought to keep before your eye clearly and closely the object you have to attain, and avail yourselves of every opportunity of accomplishing the result. The other day I saw some inferior tenements built by persons who speculate in building cottages. These inferior tenements were purchased and converted into excellent cottages—not exactly model cottages, but cottages in which a man may live in health and in some degree of comfort and happiness. These are opportunities which every man may avail himself of. This is a duty which must be performed. The question is becoming both in town and country one of paramount interest."

The Alhambra.—An extraordinary rumour is current in Paris that this celebrated palace of the Moorish Kings

of Spain is for sale. It is well known as the finest specimen of its class, and as one of the most remarkable buildings of the middle ages; and it has a great historical interest, not only in relation to its founders and original occupants, but to Charles Quint, Philippe V., and the Abencerages.

LADIES' SANITARY ASSOCIATION.—In the seventh annual report of this Association, just published, the committee congratulate the members on the increasing interest manifested in their work. During the past year the committee have issued upwards of 90,000 tracts, making a total of upwards of 703,000 published since the establishment of the Association. Clergymen and medical men constantly make application for grants of tracts for distribution among the poor. Upwards of fifty ladies have attended the college classes for chemistry, physiology, and public health, under the teaching of Dr. Wood and Dr. Richardson. The gymnastic classes have been conducted at the Home and Colonial Training Institution, the British and Foreign Training School, and the St. John's Servants' Home. Upwards of 12,800 poor children, inhabiting the worst parts of the metropolis, were sent out into the parks last summer under the charge of proper guides, the expenses being defrayed from the special fund for park parties. One of the most important of the operations of the Association during the past year was the establishment of the "London Dressmaking Company," the aim of which is to establish a dressmaking business for the furtherance of the following objects:—1st. To frame a model establishment which shall, by its example, teach others how business may be carried on without detriment to the minds and bodies of the workers. 2ndly. To induce ladies to pay their bills regularly, and to give their orders in good time. 3rdly. To provide a fund to be used according to the discretion of the directors, for the benefit of those employed in dressmaking. Several gentlemen have delivered gratuitously lectures to the working classes in various parts of the metropolis. Arrangements have been made for the delivery of a course of lectures on Domestic Economy and the Laws of Health at Mechanics' Institutions, Working Men's Clubs, Youths' Institutes, and kindred societies; and in May 1865, Examinations will be held by the Metropolitan Association for Promoting the Education of Adults in these subjects.

Correspondence.

FRESH EGGS.—SIR,—I see in your *Journal* of this date a notice of how eggs may be preserved fresh by being rubbed with a solution of beeswax and oil, so as to exclude the atmospheric air. *Apropos* of this suggestion, I would beg to observe that a Scotch farmer recently paid me a visit, and brought with him a peace-offering of seven dozen fresh eggs. These eggs had been all rubbed with salt butter as daily collected—according to an old but neglected plan. And having now, with the assistance of my children, got, alas! very near to the end of the aforesaid seven dozen, I have to testify that every egg was not only perfectly fresh, but as curdy as if it had been laid a few hours before it was eaten; and my friend informs me that eggs so treated with salt butter will remain fresh for months. Eggs of the above quality are sold to the Edinburgh shops at elevenpence the dozen, and if so, may one not ask why we Londoners are obliged to pay threepence each for not curdy—but for so-called, "new-laid?"—Yours, &c., GEORGE WYLD, M.D.

September 23, 1864.

To Correspondents.

ERRATA.—At page 687, col. 2, line 10 from bottom, before "essayist" omit "young;" p. 688, col. 2, line 37, for "Parois" read "Pavis."

Patents.

From Commissioners of Patents Journal, September 23rd.

GRANTS OF PROVISIONAL PROTECTION.

Adhesive mixture—2073—J. Allan.
Agricultural implements (Norwegian arrows)—2176—S. and W. Corbett.
Artificial stone, manufacture of—2116—P. A. L. de Fontainemoreau.
Bedsteads, cabinet—2180—A. Sharp.
Buttons, manufacture of—1619—G. Farmer.
Carriage wheels and axles—2239—B. Glover.
Coal, hewing or getting—2162—W. W. Burdon.
Cotton, &c., fastenings for bales of—2172—R. Shortrede.
Coupling apparatus—2191—R. D. Chatterton.
Elastic fluids, obtaining motive power from—2225—D. C. Knab.
Electric telegraphs—2217—H. W. Cook.
Engine, electro-magnetic—2158—A. M. J. Count de Molin.
Engines, preventing the escape of sparks from—2219—C. Moriarty.
Filtering apparatus—2178—T. H. Baker.
Fire-arms and ordnance, breech-loading—2199—T. Wilson.
Fuel, artificial—2229—R. F. Fairlie.
Gas valve and regulator—2152—E. M. Walter.
Ice, manufacture of—2235—A. C. Kirk.
Jute, preparation of—2233—A. Belhommet.
Looms—2135—W. Bullough.
Looms—2201—J. and R. Shorrock, and W. Mould.
Looms—2215—J. Holding.
Mules for spinning—2241—J. Banks.
Nautical instruments—2243—J. L. McLay and W. H. Thompson.
Ordnance—2227—C. Sanderson.
Papier maché, ornamentation of—2186—A. Smith.
Photographic impressions, &c., apparatus for cutting—2197—D Fruwirth.
Pins, &c., coating with metal—2150—T. Fowler.
Railway carriages, signalling between passengers and guard—2182—W. J. Curtis.
Railways, constructing and working—2207—P. W. Barlow.
Railway trains, signals in—2127—J. Packer.
Running rigging—2203—H. D. P. Cunningham.
Shirts—2108—J. Strouse.
Stair rods, &c., screw eyes for holding—2166—D. Greenfield.
Thrashing machines, fixed and portable combined—2211—C. J. Newbold.
Tobacco leaf, extracting juice from—2193—J. Fleming.
Umbrellas—2205—T. Restell.
Umbrellas, &c., construction of the frames of—2188—W. Clark.
Waste steam, heating water by means of—2213—D. Brodie.
Weights, use of magnets in overbalancing—2047—T. P. Tregaskis.

PATENTS SEALED.

742. J. and J. Wild.
746. S. Bark, T. Attwood, and J. D. Robinson.
747. J. T. Stroud.
754. R. A. Brooman.
755. V. Dubourg.
758. T. W. Rammell.
762. E. Lever.
763. J. Symes.
766. E. Pace.
769. J. Lightfoot.
772. J. Rees.
776. E. Grether.
780. H. Holden & E. S. Forshaw.
782. A. Heald.
785. S. Trotman.
787. D. Treadwell.
790. T. Waller.
791. T. J. Smith.
793. J. Williamson.
797. H. Bayley, L. Newton, and J. Greaves.
798. W. Martin and J. Hodgson.
802. J. Prestwich, jun., and W. Brooks.
808. J. Bickerton.
816. C. Sanderson.
839. T. Bourne.
855. W. Clark.
862. G. Smith, jun.
953. J. H. Johnson.
965. A. V. Newton.
967. W. Ehrhardt.
993. D'H. Lomer.
1097. D. Clarke.
1125. T. H. Rees.
1706. T. Sharp.
1740. W. Spence.
1742. W. Parsons.
1822. N. Salamon.
1939. T. J. V. Roz.
1940. G. E. M. Gerard.

From Commissioners of Patents Journal, September 27th.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1758. J. Adams.
2344. J. Graham.
2357. W. G. Creamer.
2365. W. Stableford.
2371. H. Plantrou, jun.
2376. J. Price.
2377. J. Jacob.
2398. G. Russell.
2417. D. McCallum.
2940. M. Henry.
2390. T. Bright and R. Mills.
2392. R. A. Brooman.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2460. W. E. Newton.
2484. J. Lewis.
2476. L. Newton.
2503. J. C. Pearce.
2463. F. C. Bakewell.

Registered Designs.

The Brunswick star jelly mould—4658—Messrs. Benham and Froud, 40, 41, and 42, Chandos-street, Strand, W.C.
Portable rotary hair-brushing machine—4659—James Beckett, Lamb's-buildings, Stephen's-green, Dublin; and Nathaniel Lewis Griffin, 17, Suffolk-street, Dublin.
The dress-preserving church book-box and kneeling hassock—4660—William Howard, jun., 23, Great Russell-street, Bloomsbury, W.C.

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Journal of the Society of Arts,
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THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, OCTOBER 7, 1864. [No. 620. VOL. XII.

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BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE—BATH, 1864.

STATISTICS OF THE NUMBER AND OCCUPATIONS OF FOREIGNERS IN ENGLAND.

Professor Levi read a paper on this subject before section F. He traced the position of foreigners in this country from past times to the present, when there was a blending of citizenship, the approaching of states one towards the other by the almost annihilation of distances owing to the application of steam-power as a means of locomotion both by land and sea, and the electric telegraph. According to the last census there were 84,090 foreigners in England and Wales, being at the rate 0·041 to every 100 natives. That, however, was considerably less than the numbers in France or the United States. In France, in 1861, there were 506,381 foreigners in a population of 37,386,313, and in the United States, in 1860, there were 4,136,175 foreigners out of a population of 27,489,461. Of the 84,090 foreigners in England and Wales 73,500 were Europeans, 9,500 Armenians, 500 Africans, and 500 Asiatics and natives of other countries. Of the 73,000 Europeans, 30,000 were Germans, 13,000 were French, 5,500 were from Holland, 4,500 from Italy, 5,000 from Norway and Sweden, 5,000 from Russia and Poland, 2,000 from Spain and Portugal, 2,000 from Belgium, and 2,500 from Denmark, and about 1,000 from Greece and Turkey. Fully one-half of the foreigners in England and Wales are located in London. Of the total number of foreigners in this country, 57,000 are males and 27,000 females ; and of the 73,000 Europeans, 13,000 were under 20 years of age, but it was not to be supposed that they were all organ boys. Professor Levi proceeded to enumerate their occupations, and went on to show that England had been slow in appreciating the benefit of attracting foreign industry to her shores, and showed that though many of the disabilities that existed against aliens had been removed they were still prohibited from becoming members of the Privy Council, and from sitting in the House of Commons, in deference to national susceptibilities. In France and the United States a more liberal principle is adopted. In conclusion, the Professor said there was something inherent in man which attaches him to the country of his birth, and which he cannot shake off, wherever he may dwell ; and we may derive solid and valuable instruction from the study of those who are constantly round us, and who in their own persons exhibit to us all the peculiarities, habits, and manners of many distinct races and nations.

THE PATENT LAWS.

In Section G (Mechanical Science) Mr. T. Webster, F.R.S., read the report of the Committee on the Patent Laws, of which the following is an abstract :—The committee was appointed at the York meeting to inquire into the operations of the patent laws. The report set forth that the Patent Law Amendment Act of 1852 had introduced a great many alterations highly beneficial to the public, but that there still remained many objections, some of which actually arose out of the new patent law itself, and which required to be removed. It was especially necessary that a check should be put upon the issue of unnecessary or useless patents, and that all litigation in respect to patents should be left to the decision of skilled assessors, instead of being decided upon, as at present, by a common-law judge and a jury. It was expected that the report of the Royal Commission, presided over by Lord Stanley, would be one entirely in that direction. Having referred to the suggestions of Mr. Dillwyn's Committee with respect to the Patent Law Library and Museum, and the proper application of the fees, the report condemned the structure as being altogether unsuited for the collection of the patents as records of the inventions of the nation, and recommended that the fees, instead of being made contributory to the general revenue of the country, should be devoted to providing better accommodation for the reception of inventions. The working of the Act of 1852 was very beneficial, as, owing to the system of periodical payments, those patents which were of no value were allowed to fall through, the inventors finding that the protection was not worth the price they had paid for it; while, on the other hand, those who patented inventions of real utility had their property in them fully secured. The objections of those who were opposed to the existence of a patent law at all, were founded on theory rather than on fact. They alleged that such a law discouraged inventors ; they had not yet brought forward any instance of it.

PRODUCTION OF COLD BY THE EXPANSION OF AIR.

In the Chemical Section Mr. A. C. Kirk read a paper on " The Production of Cold by Expansion of Air." He said :—The yearly increasing demand for ice in the tropics, where it has become all but a necessity, has not only created a most extensive traffic with the Northern States of America, but, by stimulating ingenuity, has led to the invention of several practicable machines for its artificial production ; and already in this country these machines are becoming useful assistants to the manufacturer, making him independent of the natural variations of temperature, and enabling him to conduct some operations all the year round that formerly could only be carried on in winter. Though it is the object of this paper to describe a refrigerating machine in which incondensible gas—in practice atmospheric air—is employed, it may help to make the whole subject more clear if we briefly

look at the principle and action of the earlier machines in which condensible vapours were used. The nature of the fluid used necessarily determines, to a great degree, the arrangement of such machines; but in all, whatever fluid be employed, or however arranged, a certain close relation to a motive power heat engine may be observed. In such engines there is always what may be called a hot and a cold end; at the hot end heat is absorbed, a part of which is rejected at the cold end, while part is converted into motive power; and the amount thus usefully employed is proportional to the difference of temperature between the hot and cold ends. If these temperatures become equal, no power will be given out by such an engine, and, but for friction, no power would be required to drive it; but if the temperature of what was originally the hot end be still further reduced, and an attempt made to drive it, power will be consumed. As a familiar example, take the case of an ordinary condensing steam-engine, with a surface condenser; and, to make the illustration more plain, we will suppose that we have no natural means of keeping the condenser colder than 200° Fahrenheit. Here the boiler is the hot end, which absorbs heat from the fire, part of which is converted into motive power, and part rejected, being carried off by the cold water used in the condenser to condense the steam. If we now allow the fire to die out, and suppose no friction to retard our engine, when the temperature of the boiler becomes the same as that of the condenser, the engine will stop, for then the pressure of steam in the boiler acting on one side of the piston will be equal to the back pressure in the condenser acting on the other. Let us suppose that we now again set our engine in motion this time by driving the crank, the piston working in the cylinder will, by removing the boiler, after the manner of an air-pump, cause evaporation to take place at a temperature lower than that of the condenser, while on its return the piston will, by forcing the steam into the condenser, raise its temperature to 200 degrees, at which we have the means of condensing it. This condensed water being returned to the boiler, the circle of operation is complete. The temperature at which water boils so limits the cooling power of such a machine as to render it practically useless; but it is obvious, that if for water we substitute a fluid with a sufficiently low boiling point, we shall convert what is described as an illustration merely into a practicable machine. Two fluids are in practical use, sulphuric ether and liquefied ammoniacal gas; but as the machine in which ether is employed sufficiently illustrates the principle, and has been longest known, I will in a few words describe the operation. Ether is contained in a small air-tight tubular boiler, connected by a pipe to a cylinder and piston, with suitable valves, by which the vapour, as fast as it is formed, is abstracted from the boiler, at a pressure as near a vacuum as possible, under which circumstances ether boils at a temperature little above zero, abstracting heat to maintain its evaporation from any fluid, generally a current of brine, that may be caused to flow through the tubes in the same way that the hot gases of the fire in a steam boiler supply the heat necessary to maintain steam. On the return stroke of the piston the ether vapour is ejected from the cylinder, and forced into a tubular condenser at a pressure about that of the atmosphere, by which its temperature is so much raised that it may be condensed by such water as can conveniently be got. The condensed ether flows by a small pipe back to the boiler, where it is again evaporated, and so on, continually. Such a machine was in use for fully a year, at the works of Messrs. Young and Co., Bathgate, for cooling the paraffin oil of which they are the well-known makers, in order to extract the solid paraffin it contains, a substance of great value in itself, and whose presence in the oil is otherwise undesirable. This machine proving too small for the increasing size of the work, and the use of a material so volatile, inflammable, expensive, and in all respects so dangerous as ether, being a serious drawback, I was requested, in the beginning of 1862, to try if some efficient substitute could not be found. Atmospheric air being the substitute which at once suggested itself to me as not only safe but inexpensive, I commenced a series of experiments, which at last resulted in a small model, by which I was able to freeze mercury. A large machine was immediately proceeded with, which worked so satisfactorily that the use of the ether machine was discontinued, and this year at the same works a more powerful one has been erected, capable, if applied to such a purpose, of making three tons of ice in twenty-four hours. I shall now proceed to describe the nature of this machine, which, it will be seen, is allied to the air-engine in the same manner as the ether machine is to the steam-engine. If we enclose a quantity of air in a strong vessel, into the top of which we fix a common air-syringe, and force the piston downwards by hand, we shall compress the enclosed air, which, by the power so spent, will be heated; and if we now cool the whole apparatus down to its original temperature, and allow the air to force the piston gradually back, the air by the effort will be cooled; but, inasmuch as the cooled air will not occupy the same space as the air originally did, the piston will not return to the point at which it was when we commenced, and thus less power will be given out during the expansion of the air than was spent in its compression. It is not necessary that the air be at the atmospheric pressure; if air of greater density be employed, the cooling power of the machine will be increased. We have thus got an elementary cooling machine, and as before power is spent in working it. To render this a practicable machine, the first thing necessary is to perform the compressing or heating operation, and the expansion or cooling operation in separate compartments; the one surrounded by water to abstract the heat generated, and the other surrounded by the substance to be cooled, or from which heat is to be taken. The one compartment being thus very cold and the other comparatively warm, the next thing is to provide means by which the air can be continually transferred from one to the other, without carrying heat from the hot compartment to the cold. Thus, if the temperature of the hot compartment be 70°, and that of the cold zero, the air must enter the cold compartment preparatory to expansion at a temperature as nearly zero as possible, and in returning to the hot compartment must enter it preparatory to compression, at a temperature as nearly 70° as possible. That beautiful invention of Stirling, the regenerator, or respirator, as it is sometimes called, composed ordinarily of a large quantity of wire gauze, through which the air passes, enables us to accomplish this very perfectly. When the machine is fairly a-going, the layers of gauze next the cool compartment become as cold as the compartment itself, and those next the hot compartment as hot, while the layers between those shade off through the intermediate grades of temperature. Thus the air, in passing from the hot to the cold compartment, warms the gauze and is itself cooled, and the cold air in returning is gradually warmed, cooling the gauze in its course; and although the air is continually being passed backwards and forwards from the hot compartment to the cold, and *vice versâ*, no heat is conveyed by it from the hot end to warm the cold and interfere with the cooling power of the air during expansion. By the help of the diagrams, Mr. Kirk then explained the arrangements by which this was carried out. He concluded by saying that the advantages attending the use of his machine were, that no expensive or dangerous fluid was employed, which gave so little trouble, that the first machine worked for four months without being touched. Mr. Kirk, at the request of the meeting, gave some explanations of parts of his machine which had not been understood, and those explanations fully satisfied the meeting of the practical utility of the machine. He further stated that the cost of the machine, without boilers, was £700.

Professor Miller was glad to hear the machine had been practically successful. The inventor had employed a new principle in a new, simple, and effective manner.

PROPOSED ART RESULT SOCIETY.

By C. BRUCE ALLEN, Architect.

The object of this proposed Society would be to bring again into practical operation the time-worn way of Art production by the *hand* as well as the mind of the artist.

Art has been defined by Ruskin to be man's delight in nature's works. Art may also be defined as the effort to copy in the unformed materials of the earth nature's works through the mind and by the hand of each individual artist. All genuine works of art are thus, like pictures, copies more or less perfect of nature's works, individualized and impressed with the individual Art feeling of each artist, through and by the combined operation of the directing mind and executing hand. Art is the handwriting of the artist in material written on useful things.

All the old art was produced in this way, and was simply the expression of the wants and feelings of the old artists in material, impressed on useful objects, and thus utilized and made common public property.

But that which strikes the modern observer most in looking at a work of antique art, whatever its nature, whether wrought like the Runic ornament, or of the highest order of refinement and finish, as the honeysuckle ornament on Greek fragments, is its expression of *individuality*. Like the hand-writing of a man, we can see, and are quite sure, that the same artist who invented or copied from some natural object the design, himself and with his own hands, executed the work. It is in picture painting only that this time-honoured mode of producing works of fine art in these modern days is practised through necessity. Pictures are therefore now the only products of fine art wherein the public see in its fulness and completeness the whole strength of the artist. In pictures alone do we see the artist workman and the signature of his hand.

It is for the express purpose of enlarging the range of this old and only perfect way of calling forth and utilizing the Art strength of the time that this proposed society should work. As a perfect art result may be defined as a useful object impressed with the art feeling of the artist for the beautiful wrought with his own hands, it should be the object of this society to endeavour to extend this great principle of Art action from painting, as its sole modern exemplar, to sculpture and the details of architecture, as well as to the ordinary objects in common and daily use as furniture and its ornamental details.

The necessity of some new mode of Art-action will be seen the more readily by contrasting the modern system of Art production, as now everywhere practised, with that which it is now proposed to encourage.

A work of Art in these days is not in reality an Art work at all, *i.e.*, a work of utility executed by an artist, but a work of manufacture—a work of utility executed not by one man but by a number, more or less, of hands, following each other successively as the work proceeds to completion, and these hands changing as the different and necessary pauses in the work admit. Thus in Glass Painting the original idea or sketch, the cartoon or working drawing, and the actual glass are by at least three artists or workmen. Sometimes very many more will be found to have been employed successively in the production, not only of an entire window, but each individual piece of the window and quarry will have passed through the hands of several artists and workmen, that is, will have been manufactured, like a pin or a nail, and thus be the work, not of any one artist, but of that strictly modern Art-destructive process by which one artist is made to entirely nullify the work of another. In the production of a picture on canvass this process is impossible, the whole work is by one artist from first to last, the original sketch or idea, the drawing and outline, the colour and painting, and the final finish; it is impossible to manufacture a picture. Now the sole difference between a painting on canvass and a painting on glass is in the nature of the material on which the colours are laid. Hence modern painted glass has in reality no artistic value, and, by the side of the old glass, may fairly be likened to a chromo-lithograph by the side of a genuine oil painting.

It will be the business of this society, if established, to endeavour to revive and encourage the old-fashioned Art process of the production of figures and ornaments on glass by one artist, and to regard each quarry as a picture, each quarry at least being the signature and handwriting of one man.

In the art of Sculpture, again, as now practised, this modern process of manufacture is made to accomplish its most unfortunate and art-killing work; the idea and clay model, and the actual stone or marble carving, are each by distinct artists and workmen, a *machine* doing the intermediate duty of indicating on the marble the artist work on the clay. Thus our modern statues and figures are lifeless models, for the real and effective power of the artist sculptor consists in the direct rendering in stone or marble with his own hands the Art idea in his brain, and which his own hands only can interpret. To breathe life into marble the sculptor himself alone is able, *hand* and mind together.

It would be the vocation of this society therefore to advocate and encourage the antique mode of carving and sculpture by the hand of the designing artist himself, whether an artist workman or a sculptor, whether a simple ornament or a figure. It would try to revive the oldest of all Fine Art work, viz., hand-writing on stone, as in Egyptian work.

In Architecture, the parent of the Fine Arts, this society would seek to encourage among architectural students the plan, as pursued by Inigo Jones, Wren, Pugin, and Barry, of each architect himself drawing the full-sized details of buildings, mouldings, and ornament, thus creating an architectural hand-writing, and a consequent expression of the individual Art feeling of the architect.

In common objects, as in furniture, paper-hangings, woven fabrics, metal work, jewellery, glass, china, book-binding, and others, as practised by the Art-workman in the Art factories and shops, it would be the express vocation of this society, and of other societies which might possibly arise from it—each one taking up a distinct speciality, such as book-binding—to ask from our Art workmen employed in these several Art trades specimens of each man's skill in that special Art trade, such specimen to be his entire work, thus evidencing to the full both his artistic and manipulative power. To obtain from the workman proofs and examples of his ability as an artist would thus be the great and constant aim of the Art Result Society. It would thus individualize the workman, and help to give to the world each man's signature.

It would thus be the province of this society to imitate the old method—that which has given us moderns all old Art of whatever date, country, or style—of Art production by the hand and head of the working artist; but as the method of Art production in the present day confines the executive workman to his work, and so necessitates the additional aid of the artist draughtsman and designer to indicate his work for him, that is, to provide him with the working drawing of the object whatever it is, whether a roof truss or a jewel, it should be one of the leading objects of the proposed Society to notice and encourage, side by side with the workman, the artist draughtsmen who do this—a class of men now unrecognised and utterly unknown to the public.

The mode of doing this would be by asking from such Art draughtsmen designs and working drawings of any set of common objects, of which specimens are to be seen in the shop windows, and awarding prizes to those competitors the Artist Council of the society might deem most worthy and suitable. In the following year these premiumed designs and drawings would be offered to the workmen in competition, to be worked from by them in the production of the object itself in the material of each workman's art trade, these when premiumed, would be publicly exhibited side by side with the drawings, thus to

evidence at one and the same time the skill of the designer and the draughtsman, and the skill of each individual executive workman.

It would also be the aim of the society to ask of the artists of the day examples of their practised and more learned skill in material; as for example, an Art subject etched on metal, wherein the ordinary Art practice of the artist on paper or canvass is combined with the Art practice of the workman in material, as may be instanced and examples found in the works in niello, where Fine-Art workmanship in perfection may be seen. It would ask also of our painters painting on glass.

It will thus be seen that the special work of the Art Result Society is not at present being attempted by any existing Art society; that its highest aim has been hitherto in modern days unattempted and almost unthought of; that the method will not be new, but old; and that it simply seeks to work into common things what is now only to be found in paintings; and that it would but simply obey that great law of art, nature, and necessity which compels the painting of a picture by one workman and one only, and which will always equally compel the Art production of the commonest object by one workman, and one only. It is the price which nature demands for Art, and which must ever be paid for it.

And it would be encouraged in its work by the consciousness that the Art faculty of the present time is as great as it ever was, as is proved in the works of Millais in painting, Marochetti in sculpture, and Ruskin in leaf drawing, and in the accidental efforts of some of our Art workmen, as seen here and there in Pugin's works and in Barry's Westminster work.

It would simply seek to accomplish for the many what the Royal Academy now does only for its painters.* As an independent and distinct society, if divided into sections, each taking cognisance of a single art trade, or as the Art Result Department of the Society of Arts, it would need for its Art action but a very simple apparatus, and but a moderate annual fund.

A gallery or room would be required, in which should be exhibited, for the inspection of Art workmen and students, to assist them in the due comprehension of real fine art workmanship, a small collection of specimens of objects or casts appertaining to the art trades proposed to be specially encouraged. There should also be shown in this room, by way of comparison with these, choice specimens of the Art manufactures of the day, to be selected from the shop windows, and to be occasionally changed as the fashion of the time changed, for the purpose of specially instructing the student in the nature and mode of production of the Art results in material and in Art as now applied to common objects in the art manufactories, and in works of modern fine art manufacture. It would be in the midst of these examples of old and new art products that the works produced by the artist draughtsman and artist workman would be publicly exhibited, for the purpose of instructing the public mind in the distinctive difference between the modern art as now manufactured, and the same modern art as it would be when the production of the individual artist workman.

A small collection of casts and objects of antique art have already been acquired towards this end, and some liberal promises of modern specimens have been made for the purpose of evidencing the present mode of Art manufacture. A collection has also been made of *working drawings*, by artist workmen, to evidence the present capacity of the workmen, and to show precisely what such detail drawings are, and their practical utility and application.

This collection should be confined strictly to actual objects or casts, whether architectural or otherwise, and to working drawings, and all models, sketches, lithographs, engravings, photographs, and mere *representations* of objects rigidly excluded, as it is to be feared that these have a tendency to distract the attention of the student from the real Art-workmanship itself, as seen only in the object, and from its only means, the working drawing, as its sole true interpreter to a workman. The Art Result Society would be a practical School of Art.

Class lectures should be instituted for the students and workmen in Art as applied to architecture and manufacture. These lectures would be of the kind usual in the University and King's Colleges, not popular lectures.

Members and Art workmen would have at all times the opportunity of studying the collection and attending the class lectures. But in this Art Result Society, as in others, it is hoped that the fact of doing something to encourage genuine Art-workmanship would induce many to lend a helping-hand who could not well benefit from it directly, when it is considered that the mode of action is entirely new in modern days; that its plan of Art action is now confined exclusively, and without a single exception, to painters and picture-painting, and that by its proposed mode of directly employing the Art faculty and manipulative power of the artist, whether student or workman, directly on the object itself, it would add all that value to such objects which is now to be found only in old Art, and in what are called *curiosities*.

* It may be useful to remark that in this proposed mode of asking of the individual workman the result of both his *hand* and mind labour, the ever-growing and necessary help of machinery is not to be forgotten, in the stamping, printing, and *reproduction* of Fine Art works, as woodcuts, coins, paper-hangings, book covers, and the like. The proposed system is intended to powerfully influence the *original* woodcut, die, or wood block, works that, to be of any Art value, must be by a single artist hand. Pictures and painted glass cannot be thus multiplied.

Proceedings of Institutions.

Hitchin Mechanics' Institute.—A meeting was held in the library of the Institution, on the 14th September, to distribute certificates to those who had passed successful examinations, and to consider whether it would not be desirable to form a union between the local societies of this nature. The Rev. Lewis Hensley occupied the chair, supported by Harry Chester, Esq., Joseph Sharples, Esq., C. Times, Esq., J. Pollard, Esq., &c. The Chairman having explained the objects of the meeting, Mr. Harry Chester rose and said that it was not the first time he had been to Hitchin, but he had come before them when their society was not in such a flourishing condition as it was now; he was pleased to see that they had a fine building, large rooms, and an excellent library, and also that in carrying out their scheme they had entered into union with the Society of Arts. He was also pleased that the Hitchin society had taken part in the examinations, but he observed that they had but few candidates, yet those few appeared to be successful. There was now established in London what ought to be established in Hitchin, namely, a Local Union of Institutions. It would be found to be as desirable here as in other parts of England where it had been adopted. These district unions could assist in holding minor examinations and bringing the students forward until at last they became eligible as candidates for the prizes given by the Society of Arts. What he had proposed was a union of societies throughout the whole county of Herts; the county, perhaps, was not sufficiently forward to carry out this now, but Hitchin appeared to him to be a very spirited place, and Mr. Pollard and others would meet with encouragement if they were to form into a union, say the district of North Herts and South Beds, making Hitchin the central institution. He then presented the certificates. Mr. J. Pollard read letters from the Institutions at Hertford, Royston, and St. Albans: Mr. Strickland was present from Stevenage and no reply had been received from Luton. The letters expressed a wish for the

societies to receive a report of the meeting, and to be informed as to the advantages to be derived from a union such as had been proposed, and how it would affect them. Mr. H. Chester said that in the unions established they never interfered with the management of each individual society, but the object was to co-operate together for the general good of all. The great thing was to get a competent visiting officer, some such person as a certificated schoolmaster, who would visit each society, form lists of lecturers, &c. He found that the life of a union was comprehended in their visiting officer. Mr. C. Times proposed "That a sub-committee be appointed to consider the expediency of forming into a union the Hitchin and the neighbouring Mechanics' Institutions, and report to the general meeting." Seconded and carried unanimously. A committee was appointed. The Chairman then proposed a vote of thsnks to Mr. Harry Chester, seconded by Mr. J. Pollard, and carried unanimously.

Lancashire and Cheshire Association.—In the Education Department of the Social Science Association, held at York last week, a paper was read by Dr. Pankhurst on "The Association of Lancashire and Cheshire Mechanics' Institutes: its Objects and Operations." The following is a summary:—This organisation is founded upon a sense of the advantages of concerted action. The chief objects of the Association may be shortly stated to be—1. To equalise the educational facilities and opportunities of the several districts. 2. To establish modes of procedure which, while uniform in essentials, may be sufficiently flexible to the needs of particular localities. 3. To help Institutes to make provision for a regular course of instruction by a connected system of classes. 4. To afford opportunities to the Institutes to secure competent teachers in classes. 5. To supply information upon and make arrangements for conducting examinations of the members of the Institutes. 6. A special examination of an elementary character. 7. Increased incentives to members of Institutes to submit to examination by special prizes publicly presented. 8. To furnish assistance by the periodical visitation of a duly constituted agent. In addition to a number of vice-presidents and a general council, the practical working is directed by an annually-elected executive. A visiting agent is employed, whose time is exclusively devoted to the promotion of the educational interests of the Institutes, which are distributed into groups. An itinerating library is provided, to which it is intended to add an itinerating art-exhibition. A list of paid and honorary lecturers is furnished, to which it is proposed to add a list of paid and honorary teachers. Facilities are afforded, by the formation of local boards and otherwise, for conducting the examinations of the Society of Arts, the Department of Science and Art, and other examining bodies. The number of Institutes in union is 86. The Association has conducted these examinations during the past year. The elementary examination is intended for candidates between the ages of 12 and 16 years, and for candidates above 16 years of age who, from the insufficiency of their elementary knowledge, are not qualified for admission to the final examination of the Society of Arts. In working these examinations it was determined—1. To use the papers prepared by the Central Committee of Educational Unions. 2. To appoint a board of examiners to estimate the value of the answers of the candidates. 3. To give prizes to the most successful candidates. To the examination of the Society of Arts 25 Institutes sent in candidates. Science classes in connection with the Department of Science and Art have been in operation in seventeen localities. It seems evident that the labours of the Association should be energetically directed towards giving prominence to three points in the working of the several Institutes, viz., 1. To press upon each Institute the great importance of founding such a system of classes as shall place within the reach of every member the elements of a sound and useful education. 2. To urge the application of the most earnest efforts to introduce into all branches of the elementary instruction the utmost possible soundness and accuracy. 3. To assist in arranging in every district for the employment of one or two efficient teachers to itinerate through the several parts of the district. That teaching power which any single Institute would be quite unable to provide by its unassisted efforts, becomes easily procurable when several Institutes are so grouped together that there may be a mutual participation in benefits and burdens.

Yorkshire (West Riding Educational Board).—The prizes, certificates, and medals awarded to candidates at the Examinations of the Universities, the Society of Arts, and Department of Science and Art, as well as the Elementary Examinations conducted by the West Riding Educational Board, were presented on the 21st September, in the Leeds Town Hall, by Sir S. Northcote, Bart., M.P. Upon the platform were Mr. J. S. Pakington, Mr. Henry Cole, C.B., Mr. Beecroft, M.P., Mr. Titus Salt, Rev. Canon Atlay, D.D., &c. During the evening, Dr. Spark performed a selection of music on the organ. Mr. Barnett Blake read the report, from which the following are extracts:—The special object for which the West Riding Educational Board was established was the extension of the principle of examination as a test of the results of education among all classes of the community, both in Leeds as the centre, and in all parts of the great county of York. Since the publication of the last report numerous examinations have been very successfully conducted by the Board. In October, the local examinations for the University of Durham were held in the Town Hall, Leeds. There were eleven seniors and fifteen junior candidates, from Leeds, Tadcaster, York, Harrogate, and Hull; and of the eleven seniors three obtained second-class and six first-class certificates, with the title of Literate, and two passed. Of the juniors three obtained third-class certificates, and six passed. In December the examinations for the University of Cambridge were held. There were four senior and twenty-four junior candidates from Leeds, Wakefield, Bradford, Cleckheaton, York, Harrogate, Pontefract, Woodhouse Grove, Boston-spa, Tadcaster, Giggleswick, Stockton, and Morpeth. Of the senior, one obtained a first-class certificate, and two satisfied the examiners. Of the juniors, six obtained first-class, six second-class, and two third-class certificates, and four satisfied the examiners, being by far the largest proportion who obtained honours of any place in the kingdom. In January the only provincial matriculation examination for the University of London was held in Leeds. There were twenty-four candidates from Leeds, Bradford, Halifax, Huddersfield, Otley, Scarbro', Tadcaster, Hull, Wetherby, Thirsk, Manchester, Liverpool, Accrington, Wigan, Birmingham, Wolverhampton, and Bury. Of these, seven passed in the first-class, nine in the second-class, and one in the third-class. In March the elementary examinations in connection with the Society of Arts, and under the management of the Board, were held at Leeds, Acomb, Eccleshill, Eston Mines, Farnsley, Hebden Bridge, Hunslet, Idle, Keighley, Marske, Middlesbrough, Ossett, Queensbury, Scarbro', Slaidburn, Stocksbridge, Stockton, Thirsk, and Wilsden. There were ninety-five senior candidates, of whom fifty-nine obtained certificates, and two hundred and seventy-one junior candidates, of whom one hundred and ninety-one obtained certificates. For these examinations twelve prizes for seniors, and thirteen prizes for juniors were given by this Board. The examinations of the Society of Arts were held in April, and there were twenty-five candidates; and those of pupils of Science Classes for the Department of Science and Art commenced on the 2nd of May, and concluded on the 4th of June. Thirty-three candidates were entered. The local examinations for the University of Oxford were held at the end of May and beginning of June. There were eleven senior and fifty-three junior candidates from Leeds, Woodhouse Grove, Fulneck, Halifax, Pontefract, Doncaster, Bramham, Thorparch, Boston-Spa, Harewood, Beverley, Scarbro', Sheffield, Burnley, and Newcastle-on-

Tyne. A second half-yearly examination for matriculation in the University of London was held in the Town Hall in June last. There were thirteen candidates, and nine of them were successful. Abundant evidence has thus been afforded of the extent and value of the work which is being done by the West Riding Educational Board, and the important aid which is given to the promotion of the education of all classes on the only sure basis of sound instruction.—The Chairman said that it appeared from an account of the results of the Oxford University examinations, that while in 1858 only 37 per cent. of those who presented themselves for examination satisfied the examiners, in the present year no less than 67 per cent. satisfied the examiners. Considering that this system of examinations was set on foot in order to apply a test to the educational system throughout the country, in order to ascertain how far the schools are doing their work properly, and how far those educated in them are receiving the benefits which the schools are intended to confer, it must be satisfactory to see that within the period of six years so large a progress had been made. It was not only because the examinations which this Board was conducting presented results of that kind that he rejoiced at the work done, but because he was glad to find that there was in this important metropolis of the middle classes, a body of persons who were paying attention to education, and whose co-operation would be most valuable at the present time, when the education of the middle classes is attracting so much attention in the country. At one time people used to look upon and speak of education as a simple amount of instruction or as the imparting a certain amount of knowledge. By degrees it began to dawn upon people that there might be more in it than simple instruction, that education meant not merely the imparting of knowledge, but the formation of character, the formation of habits of mind, which would enable people to acquire knowledge for themselves. And then, strange to say, we had rather exaggerated that truth, inasmuch as in many places there was a disposition not to overrate instruction but actually to underrate it, and to make so much of what we call the training and discipline of education as to treat instruction—definite instruction—in matters which might be of use to persons in the pursuit of life, as if it were absolutely non-essential, and should constitute no part of education at all. The great difficulty to be met with was this, that we must endeavour to combine, as far as possible, the educational process with the instructional process. We must be careful, in laying down a system of education, not to make it either materialistic or too simply utilitarian, so as to drive away the student it was desired to retain. If that was the view to be taken they would see that it was of the greatest importance we should endeavour, in laying down any system of education applicable to the middle classes, to provide such a scheme of education as will at once give the most that can be given in the way of general training and general development of character, and which at the same time will give that which they most need for the particular pursuits to which they are to devote their lives. The Chairman went on to argue that the principle of "supply and demand" when applied to education was not sufficient, as there was in fact not enough enlightenment to produce a demand, and that these examinations, as demonstrating the value of education, exercised a most useful influence. Examinations, judiciously conducted, furnished the most perfect test of the character of the work of any student. How was the machinery for examinations to be supplied? We ought not in this matter to be wholly resting upon the Government. It was a matter which the people of England must mainly do for themselves. At the same time they must not be too proud to accept asistance in the way of advice, organisation, or encouragement on the part of the Government, if such should be found desirable. The assistance from the Universities in this matter was most valuable, as well as that afforded by the Society of Arts, and other bodies which undertake the management of examinations of this sort. After touching upon the subjects of grammar-schools, and urging the importance of a wiser distribution of their endowments, Sir Stafford Northcote concluded by a brief and encouraging address to the successful students, and then distributed the prizes. The Rev. Canon Atlay moved the first resolution, to the effect that the Local Examinations of the Universities of Oxford, Cambridge, and Durham offer an effectual mode of testing the soundness of education in middle-class schools, and, by the excellent arrangements and prizes of the West Riding Educational Board, had been made of great advantage to the schools of Yorkshire and the north-east of England. This was seconded by Mr. Beecroft, M.P., and carried. Mr. Henry Cole, C.B., moved the second resolution, as follows:—"That the system of Examinations in special subjects by the Society of Arts, with the award of certificates and prizes to successful candidates, having proved a most valuable stimulus to adult education, and the Elementary Examinations in connection with the Society of Arts being a most important aid to the members of Mechanics' and similar Institutes in preparing them for examinations of a more advanced character, they are deserving of public support, in order to render their advantages more generally available." Mr. Pakington, in seconding the resolution, said, it was the object of the Local Educational Board, established in connection with the Society of Arts, to give publicity to their proceedings and facilities to the candidates who wished to attend these Examinations. The Society had found that a great and growing want had been felt throughout the country of a test of the education obtained at the classes in connection with Mechanics' Institutions, and had thrown out those inducements to the members. There had been lately instituted a Committee of Unions, meeting under the auspices of the Society of Arts, to promote uniformity in the standard of Elementary Examination in each provincial district. He had no doubt that if all the Local Educational Boards were as energetic, and carried out their work as efficiently as that of Leeds, the cause would prosper. The resolution was unanimously agreed to. Mr. Alderman Kitson moved a resolution to the effect that the Board were entitled to the support of the public of Yorkshire and of the north-east of England. This was seconded by the Rev. Mr. Longsdon. On the motion of the Rev. Canon Atlay, seconded by Mr. Beecroft, M.P., a cordial vote of thanks was given to Sir Stafford Northcote for presiding.

Fine Arts.

Encouragement of Line Engraving in France.—The recent competition for the grand prize of Rome is likely to prove important to the engraver's art; the specimens submitted to the jury were so inferior that no prize was awarded, and the fact is but too evident that, in consequence of the comparative cheapness of photography, or from that and other causes combined, the burin has become almost a neglected instrument. This is certainly greatly to be lamented, and the artistic world of France has taken the alarm. There is in the Louvre a department of Chalcographie, for the express purpose of encouraging engraving, but it has not sufficient funds for the purpose, and perhaps the very nature of a governmental establishment is against it. One complaint made against it is, that sufficient encouragement is not afforded to native art. In these circumstances the city authorities of Paris have taken up the matter, and are about to try and raise up the engraver by giving him some important commissions. The first step taken is to be the engraving of the principal works which ornament the churches and municipal buildings, and some of those in the fine church of Saint Eustache are selected to commence with. Three engravers have been commissioned to reproduce the paintings by M. Signol in one of the chapels of that edifice, con-

sisting of three subjects and two single figures, at an estimated expense of a thousand pounds. The plates will remain the property of the city of Paris, and it is probable that an arrangement will be made with the engraving department of the Louvre for the publication of the prints, as was done by the city some time since in the case of an engraving of a portrait of the Emperor after Horace Vernet. The only kind of engraving, except that on wood, which is much practised in France at the present moment, is etching, and some of the works of this class are admirable. There is a society of *aqua-fortistes*, now three years old, which has published some remarkable etchings. The art is taught in the schools of art, and a course is about to be commenced in the female school in the Rue Dupuytren, of which Rosa Bonheur is, or was, the directress. There are also some important works of this kind being executed for the government, which will be noticed shortly. In connection with this subject it may be mentioned, that the Superintendent of Fine Arts has authorised the reproduction, by means of photography, of the sculpture, both ancient and modern, in the Museum of the Louvre.

Public Works of Art in Paris.—The present is harvest time for French painters and sculptors. In addition to all the works which have been recorded as in progress, a number of commissions have been given for the decoration of the fine church of Saint-Sulpice, and two small chapels have just been completed. M. Bonnegrace has also recently painted a fine picture for the church of Saint-Louis, in the island of that name. M. Saley, member of the Institut, is now at work on a statue, to be cast in bronze, of François Premier, for the vestibule of the central court of the Hôtel de Ville; and M. Crank on a bust of the Empress, for the throne room of the same magnificent City Palace. In addition to these commissions the Prefect of the Seine has purchased four busts, attributed to Canova, representing the four brothers of Napoleon, for the four angles of the Salon de l'Empereur, in the same building, decorated twelve years since by M. Ingres. These busts were formerly at Malmaison.

Amiens Museum.—This is a new establishment on a grand scale, and it and other provincial galleries are being raised into importance by the Government of Louis Napoleon. The Amiens Museum has been declared to be Musée-annexe of the Louvre, and has, in consequence, received some pictures for which there was no proper space in the Luxembourg gallery, and some others out of the reserved stores of the Louvre. It is said that it is also in contemplation to send good copies of famous pictures to the various provincial galleries. Such distributions are most praiseworthy, and with such a wide field open it is to be hoped that in a short time no picture or statue worth seeing will be hidden in the store-rooms of the Louvre or elsewhere.

Exhibition of Cartoons at Brussels.—The literary and artistic institution of Brussels has just opened an exhibition of cartoons, under government patronage. The painters Kaulback, and the Eckels, of Munich; Henri von Hess and Julius Schnorr, J. Henbach and C. Muller, of Dusseldorf; and the French artists Hippolyte Flandrin, Victor Orsel, and Chenavard, are prominent amongst the exhibitors—one alas! posthumously. The cartoons contributed by the last-named artist are those intended for the decoration of the Pantheon by the Provisional Government of 1848, and which were to be seen at the Universal Exhibition of 1855. The committee has had the good taste to borrow some choice paintings in order to enliven the appearance of the Exhibition, which would otherwise have been of too monotonous a character.

The Munich Venuses.—A report is current that the King of Bavaria has caused the three statues and the famous torso of Venus to be withdrawn from the Hyptotheque, and shut up in a private room in the Pinacotheque. This, if true, would be bad enough, but if, as asserted, the finest of the three statues was thrown down in the act of removal and "broken into a thousand pieces," a strange caprice has resulted in a real misfortune. It is to be hoped that the whole report is unfounded.

Sale of the Late King of Denmark's Gallery.—The collection of Frederick VII. has been announced for sale; it includes six hundred works, amongst which are pictures by Rembrandt, Rubens, Van Dyke, Robera, Salvator Rosa, Correggio, and other great masters, but the greater portion are the work of Danish artists. The sale was to take place at the Château of Christiansborg, in Copenhagen.

The Colossal Statue found in Rome.—This fortunate discovery has given rise to much conjecture, and to accounts so contradictory as to create an impression that either the whole story is a myth, or that somebody is busy disseminating information he does not possess. It is said, on the one hand, that the work is gilt bronze, that it has been laid bare to the knees, but that the excavations had been stopped by an irruption of water. At first, it is said, the statue was taken to be that of Pompey, because it was found in the ancient circus which bore his name, but no resemblance could be found to existing likenesses; then it was conjectured to represent Diocletian, why, is not stated; lastly, the *Correspondance Litteraire* calls it without hesitation "the celebrated Satyr attributed to Praxiteles," of which copies exist in several European museums, the Louvre amongst others; we say copies, for all agree that the original was lost. The broken statue just discovered is certainly an original; the artists and antiquarians who have seen it have no doubt about that. It is moreover of remarkable beauty, and has even been pronounced by a perfectly disinterested person to be one of the finest bits of sculpture in Rome. This statue, representing the Satyr of Praxiteles then, being an original, it may be safe to conclude that it is the very marble which was wrought by the chisel of the Athenian sculptor; in fact, if the original existed at Rome, where could it have been better placed than in a room of the apartments of the Emperors, that is to say, precisely where it has been discovered. The hypotheses and contradictions here are plentiful enough, but the proofs of this bronze statue being the original marble worked by Praxiteles are unfortunately not quite conclusive. We must curb our impatience a little, and hope that the exquisite Venus, so-called, of Milo, may have a worthy companion raised from the Roman dirt.

Photographic Printing.—A new invention is announced which, if it accomplishes what it is stated to effect, will give a great impulse to the Art. The nitrate of silver and hyposulphite of soda, the two agents now employed in the production of positive prints, are entirely got rid of, as well as the use of albumen for giving a surface to the paper. Photographs printed on the present system, with these substances, are, except under special circumstances of very careful preparation and careful custody, liable to fade and change, and no absolute reliance can be placed upon them for lasting. Hence it has been a great desideratum in the photographic world to attain the object by using other substances than those named above, which are known to chemists to have in them, as it were, the seeds of decay. Carbon has been tried in various ways, and great progress has been made of late in this direction, and very beautiful results, indeed all that could be desired, have been accomplished, but the process is not easy of manipulation, and requires great care, time, and skill to effect, involving the risk of many failures, so that, for general use commercially, it is not likely at present to be adopted. The actual details of the new process are not yet made public, but it consists in coating a sheet of paper with collodion, in which are dissolved certain salts of uranium. When dry, it is exposed to the light under a negative, in the same manner and for about the same length of time as paper prepared on the present system. It is then washed in a liquid, said to be an acid, which dissolves all the ura-

nium salts, after which it is washed in plain water for a few minutes, and the picture is complete, the tone being of a bistre colour; this, however, can be changed into the usual deep purple tone by the ordinary toning process. The invention is that of M. Wothly, of Aix-la-Chapelle, and its permanency is alleged to have been tested by a vast number of laboratory experiments. It must, however, be added, that specimens done by this process twelve months ago in this country, by M. Wothly himself or his agent, do not come up to the perfection of silver prints in beauty and delicacy, and appear to have decidedly changed. It is moreover stated that a firm in Paris, which commenced working the process there some time since, has now abandoned it entirely.

Manufactures.

Dispute in the Carpet Trade.—In May, 1863, an agitation commenced in the above trade for an advance of wages equal to 10 per cent. upon the weaving of Scotch carpeting. In the following July the Carpet Manufacturers' Association held their annual meeting at Halifax, when a deputation from the workmen presented a memorial setting forth their requests, but, after discussing the question at great length, the meeting gave an adverse decision. The deputation went back to their respective districts and apprised the workmen of the result. Special meetings of the trade were held, and resolutions passed urging on their central committee the necessity of using their influence with Mr. William Henderson, of Durham, president of the Masters' Association, with the view of obtaining a special meeting of that body to reconsider their decision. In compliance with a memorial to this effect, the president consented to convene a special meeting of the masters, in December, at Leeds, and when it took place, the same deputation of workmen was once more in attendance. The result was, that the masters admitted the workmen's claims to be reasonable, and expressed their own readiness to comply on condition that the manufacturers of like goods in Scotland would give a corresponding advance to their workmen within six months from February 1. The workmen in Scotland now began agitating for this advance, and a meeting of the Scottish manufacturers was held on the subject in February, at Glasgow, the issue being, as at the first similar meeting in England, a refusal to accede to the wishes of their workmen. The agitation in Scotland still continued, and after ascertaining the opinions of the workmen of Scotland upon the question at issue, a united deputation of English and Scotch workmen waited upon each of the Scotch masters, and personally solicited their influence with Mr. Hugh Wilson, of Kilmarnock, chairman of the Scottish Masters' Association, with a view of obtaining a special meeting of that body to reconsider the decision come to at Glasgow. A second meeting took place in July, in the same city, which was largely attended, and the English president, Mr. Henderson, was present by invitation. A deputation of Scotch and English workmen also attended. A long discussion took place on the question at issue, ending in a resolution which would virtually have given an advantage of 10 per cent. in the weaving of certain fabrics to the Scotch manufacturers over their English brethren. This was at the time protested against, and a meeting of the English masters was held a few days later at Leeds, when a deputation of their workmen again attended. At this meeting the English masters decided to make these two propositions to the masters of Scotland:—First, a scale of wages giving to the workmen all they asked for and establishing a difference of five per cent. in favour of the Scotch over the English masters; second, a somewhat lower scale of wages establishing a similar difference of five per cent. The Scotch masters at once accepted the first proposition, and thus a complicated question was satisfactorily arranged. The attendant difficulties may be estimated when it is considered that the money interests of the English and Scotch masters are opposed to each other, and that the interests of the workmen of each country were opposed to those of their masters. All matters being now fully arranged to the entire satisfaction of all parties, the new scale of wages came into operation on the 1st of October. Such is the brief history of an agitation worked throughout on purely moral principles. While many other trades are suffering under the lash of their own follies the carpet weavers are reaping the reward of prudence and forethought. Would it not be wise for other trades to follow the example this case presents, and let employers and workmen meet annually to settle their differences by reason and argument, instead of resorting to coercion and intimidation? Many years have now elapsed since the harmonious feeling betwixt the masters and workmen was disturbed, and now their relations are strengthened by mutual confidence and respect.

Industrial Exhibition in the Coachmaking Trade.—A meeting of the employers and workmen in the above trade was recently held, at the Carriage Bazaar, Baker-street, to consider the propriety of establishing an Annual Industrial Exhibition. The meeting was presided over by G. N. Hooper, Esq., who stated the great pleasure he felt in meeting so many skilled artisans willing to support the proposal, and he was quite sure that an exhibition, open to all branches connected with carriage building, would prove very attractive, not only to members of the trade, but the general public, who were at present quite ignorant of the method upon which carriages were constructed. Resolutions approving the object of the meeting, and also soliciting the co-operation of the Society of Arts and the Worshipful Company of Coach and Coach Harness-makers, were moved by J. F. Woodall, Esq., G. Thrupp, Esq., and J. Robinson, Esq., and carried unanimously, after which the meeting was adjourned until Thursday, the 6th of October, when a committee will be formed.

The Deterioration or Crystallisation of Wrought Iron.—An article in the *Engineer* reproduces the explanation given last May by Mr. Paget, C.E., before the Society, of the deterioration of wrought iron. It will be remembered that it was pointed out, and evidenced by numerous experiments, that wrought iron is rendered more or less brittle by strains in excess of the limits of elasticity. 2. That a crystalline fracture is produced by any sudden rupture. 3. That a state of brittleness—whether due to defective manufacture or to excessive strains—would render a bar peculiarly liable to rupture under impulsive forces. 4. That rupture under such circumstances must be sudden, and consequently crystalline in appearance.

Beet Root Spirit.—The Commissioners of Inland Revenue in their last report say:—"After patiently watching these experimental distilleries for seven years we are relieved from further anxiety on the subject by the final relinquishment of the manufacture by the last of those gentlemen who had embarked in the undertaking. We understand that in all these cases the experiment has entirely failed as a remunerative speculation."

Malt.—It appears by the report of the Inland Revenue Commissioners that the number of bushels charged with duty in the year ended 31st March, 1863, was 41,064,830, and in that ended 31st March, 1864, 47,935,949, showing an increase of 6,871,119. The quantity made in 1864 exceeds by 2,379,763 bushels the largest ever before charged in a like period. This is attributable to the unusually fine quality of the barley grown in England in 1863, and to the small stock of malt on hand at the end of the previous year. The stocks at the present time are very considerable, a circumstance which must be taken into account in estimating the duty for the current year.

Commerce.

Sea Fisheries Commission.—It appears from evidence given before this commission that considerable changes have of late years taken place in the extent and profitable character of the fisheries on the coast between the mouth of the Mersey and the Isle of Man on the east and west, and Cumberland and Carnarvon Bay on the north and south. During the last 20 years the number of boats employed has not materially increased or decreased, but the boats have been of larger build during the last few years. Within four or five years past, a practice very injurious to the fisheries generally has grown into formidable proportions, and threatens to destroy the supply of soles, haddock, plaice, turbot, and other fish, which has hitherto been equal to the demand of the Liverpool market, and a large extent of country besides. The shrimping boats, which fish on the mud and sand banks in the Mersey, upon which vast numbers of young fish feed, carry, besides their shrimp nets, trawling nets, with very small meshes, and during the months of August, September, and October, they catch enormous quantities of the young fish and bring them to market. To this the dealers attribute the great falling off which has been observed during the last four or five years in the spring fisheries. The supply of soles has diminished very greatly, haddock has almost disappeared, and the general decrease is described as very serious. The witnesses examined by the commission did not consider the shrimping injurious, but they urged the necessity of prohibiting the use of small mesh nets on the feeding banks; and some of them recommended a restrictive enactment forbidding the dropping of a net within ten miles of the mouth of the river. It was even suggested that if such regulations were imposed the supply would be doubled next year.

Colonies.

Cultivation of Sugar in Queensland.—In the selection of land for a sugar plantation, care should be taken that the soil is adapted for the purpose, as chiefly on this will depend the quantity of saccharine matter. The yield on the most favourable soils is double that of calcareous marl or sandy soils. The plantation should be on an incline if possible, or on a high level, so that it will not be subject to swamping, and will not require much drainage. Black clay is the most suitable, as it will retain the moisture longer than any other. Alluvial soil, from 12 to 14 inches on clay, is also very good. Rich alluvial soil is good, but canes grown in this ground will not have hold sufficient in the soil to withstand strong winds. As they grow very soft in this soil, too, strong winds are likely to do them much damage. The varieties of sugar canes being indigenous to China, it was from thence they were first imported into the West Indies and other colonies. They include the green, the ribbon, the Mexican, and Otaheitan. The ribbon stands next to the green in growth, but the others are very backward. When the canes attain their full height, and are ripe, they should be cut down at once and manufactured, and not be allowed to sprout from the eyes, as the juice then loses its sweetness and takes double the time in boiling to the consistency of sugar. Also before the canes are ripe there is the same effect in boiling. In cutting the plants, as in planting, each labourer takes his row, cutlass in hand, the cutter's wife, or a lad, behind each cutter tying up the canes with the refuse tops; they are brought to the margin of the field, tied up in small bundles, and then packed in the cart and taken to the mill for grinding.

Adelaide.—South Australian Society of Arts.—The 7th annual report says that there is much reason for congratulation and great encouragement in the fact of the Institution having attained the 7th year of its existence. In the first year of its operation, the Society numbered 65 members, the present year's list contains 221 names. The annual Exhibition, which in 1857 yielded £64 11s., with an attendance of about 1,300, yielded last year only £55 6s., with an attendance of nearly 3,000, the larger portion of whom were admitted free. Thus it appears that the annual Exhibitions have been popularised by free admission on certain days, and it is expected that this liberality on the part of the Society will be productive of good effects in subsequent years. The art objects collected for exhibition have met with a more extensive appreciation. In the number of works of art sent in for competition the increase has been immense. In 1857 not more than four pictures were sent in, while in 1863 not less than 46 were admitted. In fact, there has been a rapid advance in the number, and a not less marked progress in the style of colonial works of art, and the Committee have observed with pleasure that year by year the colonial pictures exhibited are becoming more numerous, more interesting, and of higher artistic value.

New South Wales.—The customs revenue collected, at the port of Sydney during the month of May amounted to £47,657 15s. 2d. For the corresponding month of the year 1863, the receipts reached £98,537 0s. 3d. The decrease on the month is, therefore, £50,879 5s. 1d., or about 51½ per cent. The reason for this great falling-off in the customs revenue is owing to the fact that at that time last year considerable excitement was caused by the Conference at Melbourne, and this induced speculators to take out almost all the wines and spirits then in bond, on which it was supposed the duties would be increased. During the first five months of the present year the customs revenue has amounted to £231,756 7s. 1d. against £325,473 7s. 6d. for the same period of the year 1863. The decrease on the five months is, therefore, £93,717 19s. 7d., or 28½ per cent. But during the present year £16,000 was received for duties under the new tariff, which did not pass, and this amount has since been refunded, consequently the decrease on the present year will amount in round numbers to £110,000, or 34 per cent. This falling-off in the customs revenue, however, may not average more than 17 per cent. for the year, because during the last six months of the year 1863 there was a considerable decline, and the revenue for the month fell as low as £29,000. The average monthly receipts for 1863 amount to £52,000 against £43,000 for the present year. The decrease per month is, therefore equal to £9,000, or 17 per cent. The following are the, amounts received monthly during the first five months of the years 1863 and 1864:—

	1863.				1864.		
January	£62,945	13	7	...	£49,509	6	8
February	48,075	0	9	...	49,259	19	2
March	54,544	4	10	...	41,147	12	0
April	61,371	8	1	...	44,181	14	11
May	98,537	0	3	...	47,657	15	2
	£325,473	7	6		£231,756	7	11

Minerals of New South Wales.—Each colony except New South Wales has already become distinguished for some special productions:—Victoria for its agricultural and auriferous wealth; Adelaide for its copper and wheat; Western Australia for its timber and fisheries; Queensland for its pastoral capabilities. New South Wales, despite the aid she has received from her magnificent harbour and from other adventitious circumstances, has now ceased to hold her own as a wool-growing country, has failed as an agricultural country, and has been fairly outstripped by Melbourne in matters commercial. Nothing has been attempted in New South Wales as compared with what has been accomplished elsewhere to unfold and render productive the natural wealth of the country, viz., its mineral wealth. No colony in the Australian group possesses coal in the quantity, or of the quality, or in the

favourable sites in which this valuable mineral is to be found in New South Wales, and this even in close vicinity to the capital. Many valuable clays and ores abound throughout the colony, particularly iron and coal. These minerals at this moment exercise a paramount influence over our destinies in many parts of the world, and they must inevitably continue to do so, at least during this iron age. Iron ore is to be found in many parts of this colony side by side with coal beds. Notably, at Brisbane Water, there are rich lodes of iron ore almost overlying bituminous coal beds, and in close vicinity to thick strata of fire clay. Lime shell is procurable at the same spot at several wharves, alongside of which vessels much above 100 tons burden may be moored in perfect safety. Such a fortuitous combination of all the elements requisite for the production of iron can hardly be exceeded. But at Brisbane Water its value is peculiarly enhanced by its existence within twenty-five miles of Sydney Harbour. Strange to say, this valuable product was ignored, until recently undeniable proof of its reality was afforded by the importation into Sydney of specimens of each mineral direct from Brisbane Water. These have excited much public attention, and it is to be hoped they will be turned to profit. It is in contemplation to work some of the gold mines of New South Wales by Victorian companies. In the latter colony, gold mines are worked with profit, giving only a return of ten pennyweights to to the ton. In the former colony, a yield of double that amount is not considered remunerative, and mines giving such a yield remain now deserted.

Emigration to Melbourne.—A return published by Government shows that in the eleven months ending 25th May last, 1,579½ statute adults (representing 1,844 persons of all ages) were sent from England and Wales under the immigration regulations; from Scotland, 573 adults (663 persons); and from Ireland 3,427 statute adults (or 3,637 souls). There were thus 5,579½ statute adults or 6,143 persons of all ages sent from the three kingdoms during the past eleven months under the regulations.

Flour from South Australia.—An Adelaide paper states that there is now every prospect of that great desideratum being attained—the export of South Australian flour in barrels, and not in bags. This change has been urged for years past, but it was feared that the extra cost of barrels would preclude the use of the former. An enterprising merchant of that city has sent orders for the shipment of a large quantity of barrels, and also forwarded instructions to his agent to open negotiations with the best American houses with a view to a regular supply of American flour barrels for the export trade of South Australia.

Birds for Australia.—A New Zealand paper states that the ship *Violet* has arrived from England. A very large number of British birds were shipped on board of her, but most of them died on the voyage. Out of six dozen sparrows only two survived; all the larks died. Eight blackbirds, twelve starlings, eight linnets, eight yellow-hammers, and some chaffinches and greenfinches were landed.

Publications Issued.

Pocket-Book of Practical Rules for the Proportions of Modern Engines and Boilers for Land and Marine Purposes. By N. P. Burgh. (*Spon.*) Oblong 32mo., pp. 190.

Practical Illustrations of Modern Land and Marine Engines. By N. P. Burgh. (*Spon.*) This book shows in detail the improvements in high and low pressure, ordinary and surface condensation; together with Cornish land and superheating marine boilers. Imperial folio.

The Engineers' Guide to the Royal and Mercantile Navies. By a Practical Engineer. Third edition, carefully examined and revised by Mr. D. F. M'Carthy. (*Virtue.*) This work contains the new Act of Parliament, with hints on the Question of the Board of Trade Requirements; also a full account of the indicator, &c., illustrated with diagrams, &c., and oral questions and answers, assisting the engineer to pass the *viva voce* Examination. 12mo. cl. sd., pp. 144.

The Anthropological Society has just issued another volume, "The Plurality of the Human Race," by George Ponchet; translated and edited by Hugh J. C. Beavan. In this, while bearing testimony to the value of M. Ponchet's writings, the translator states that his own opinions differ considerably from the author's, and especially upon the question of spontaneous generation.

Notes.

Streets named after Artists.—In the recent changes made in the street nomenclature in Paris, the names of literary, scientific, and artistic celebrities have been largely introduced. In the list are the names of Froissard, Béranger, Laplace, Victor Cousin, Fresnel, Dupin, Bernard-Palissy, Casimir-Delavigne, Vernet, Harvey, Titien, Rubens, Niepce, d'Alembert, Lalande, Marmontel, De Musset, Talma, Claude Lorrain, Decamps, Lancret, Beethoven, Donizetti, Scheffer, Petrarch, Poussin, Bellini, Raphael, Ingres, Le Sueur, Delaroche, Galvani, David, and Davy.

Discovery of an Immense Mass of Flint Implements.—Last year, what is supposed to have been the remains of a place of manufacture in the time of the age of stone, was discovered at Pressigny, in the French department of Indre-et-Loire, by the Abbé Chevalier. A more important discovery has recently been made in the same neighbourhood by Dr. Léveillé, of Grand-Pressigny, and it has been communicated to M. Elie de Beaumont and the French Academy by the Abbé. It appears that the quantity of half-worked flints and implements found in this supposed ancient manufactory is immense, and they lie sometimes almost absolutely on the surface of the ground. The largest specimens yet found are about eight inches long, and most of these are of an irregular prismatic shape, tapering at both ends; the ploughmen turn them up by thousands, and pile them up at the edges of the fields. The peasants, struck with their form, have given them the name of pounds of butter. The finished implements consist principally of hatchets, hammer heads, knife-blades six to eight inches long, scrapers, and lance heads. The supposed manufactory extends over several acres. But the most interesting discovery of all is that of a large block of hard, brown, free stone, which is scored on the surface with deep angular grooves, which appear to have been for the purpose of polishing the flint implements; this stone measures about ten inches by six. Most of the flint is white, but many of the pieces found are of a reddish colour. The immense quantities to be found may be guessed from the fact, stated by the Abbé Chevalier, that two persons from Poitevins collected many hundred weight in a few hours without digging or otherwise disturbing the ground. The site is known as the Claisière, and is situated nearly at the highest part of the plateau which divides the valley of La Claise from that of La Creuse. It is situated at an altitude of rather more than three hundred feet above the sea, and nearly that height above the rivers in the neighbouring valleys. The soil is a mixture of clay and silex, the latter being both in grains and nodules; it is not more than five or six feet deep, and reclines on a bed of chalky loam. The formation is said to resemble that of the free stone range of Fontainebleau, and to be beyond all question antediluvian.

Provincial Rewards for Industry in France.—The General Council of the Department of the Somme has

for some time voted a sum of money for the purpose of awarding medals and recompenses to the most deserving amongst the industrial classes of the neighbourhood every three years. The distribution took place recently in one of the galleries of the Musée Napoleon, in the chief town of the department, Amiens. The whole of the Council was present, and the proceedings were marked by great enthusiasm. The prizes varied from 25 to 200 francs, and were accompanied by medals. The number of recipients, male and female, amounted to fifty, and the prizes were bestowed for inventions, improvements, and services rendered to industry, for fidelity, and for long service. The most popular recipient of a first class prize, with silver medal, was a workman, named Pierre Charles Buiret, a native of the lock-making town of Vimere; he is 43 years of age, and his inventions and improvements are said to amount to three or four times that number. Amongst other achievements, he is said to have reduced the cost of the manufacture of furniture locks to the extent of 40 per cent.; he is the inventor of a machine for bending the plates of the locks to sharp angles with great precision and rapidity; the machine works by steam, and is in use in the works of M. Valery Fournier, at Dargines. Amongst the prizes for long service, one was given to a widow 85 years of age, who had served for 74 years in the same employment. The President of the Chamber of Commerce of Abbeville took the opportunity of citing the example of a gentleman present, M. Petin, who, having quitted Amiens an artizan with twenty pounds in his pocket, became maire of a neighbouring place, and proprietor of a factory which employs more than six thousand hands.

KING'S COLLEGE (LONDON) EVENING CLASSES.—These classes will commence on Monday next. Professor Levi's course this year will commence with a lecture on the present state and prospects of the rate of discount, and include lectures on commercial crises, on the principal trades of the empire, on means of communication, on coinage and banking, and on commercial law, including shipping, partnership, bills of exchange, and other branches.

ARCHÆOLOGICAL DISCOVERIES IN FRANCE.—During excavations lately made on the borders of the wood of Rochecardon, in the outskirts of Lyons, a Roman camp has been laid open. The remains of iron arms were found in great quantities at various depths, as well as fragments of brass armour, fibulas of curious form, rings, buckles, divers ornaments, pieces of metallic mirrors, and other objects. At the depth of about twenty feet several arms were found entire; swords, axes, lance heads, arrow points, portions of casques and shields, all in iron, and in fair preservation. There were found also medals of Domitian, Antoninus, Marcus-Aurelius, and one in silver of the Emperor Albinus. The position of this newly-discovered camp, situated on the summit of a hill on the banks of the Soane, near another camp long known to antiquarians, near Ecully, gives rise to the belief that here occurred one of the sanguinary episodes of the great battle between Albinus and Septimus-Severus, which was concluded, according to the opinion of the *savans*, on the plain of Sathony, on the opposite bank of the river. The arms thus discovered have been purchased by M. Vaganay, a well-known antiquary, residing in the Rue Imperiale at Lyons. Another important discovery has been made by the dredging of the River Mayenne, at Saint-Leonards ford, near Brives, namely, the foundations of a Roman bridge, which, it is supposed, was a wooden structure and only for foot passengers and equestrians using the ford, in the middle of which stands an ancient mile stone bearing the remains of an ancient inscription. It is supposed that the road from Neodunum (Jublans) to Ingena (Avranches), passed over the river at this spot. The workmen have discovered a large quantity of Roman copper money, principally of the time of Augustus, Tiberius, Germanicus, Claudius, Nero, Vespasian, Titus, Domitian, Nerva, Trajan, Adrian, and Antoninus. Most of the coin is new, and without oxidation. With these were many small ornaments in bronze, including two small hatchets and a number of brooches or mantle pins. The authorities of the place and the government engineer on the spot have organised the search, which creates an intense interest, and which will furnish valuable matter for the museum just established at Mayenne. The presence of the large quantity of coins is accounted for in the following manner:—The Romans were in the habit, when crossing a stream, to throw in small pieces of money and ornaments, as propitiatory offerings to the divinity to whom the river was dedicated. When the river Vilaine was deepened at Rennes, and that of Morgan at Villefranche, in the years 1841 and 1842, an immense quantity of coins and other small objects was found. Amongst the rest a portion of a terra-cotta statuette was found, conjectured to be an image of Venus Anadyomene, to whom it is imagined the river was dedicated. M. Trouillerd, of the Mayenne bar, is engaged in drawing up a memoir on the subject for the Emperor. Ernée and Jublans are marked in the old itineraries as stations on the roads from Valognes to Tours, and from Lyons towards Coriallum, to the east of Cherbourg, and as the name of the town of Brives signifies in the Celtic language a fort, it seems probable that such a building existed near the spot referred to. A third discovery has taken place at the Chateau-Gaillard, near the Andelys,* where the entrance of a tower has been laid bare, but funds are wanting for pushing the examination. Some small objects have, however, been brought to light—a small crucifix, a key, and a coin. The last is of the coinage of Henry VI., proclaimed King of England and France in 1482. On one side are the arms of the two kingdoms, with the words, "Henricus—Francorum et Angliæ rex," and on the other side a cross, a fleur-de-lis, and a leopard, with the words "Henricus—Sit nomen, N.D.I., Benedictum." Not long since a coin of John, King of England, was found near the spot.

POSTAGE TO HOLLAND.—Letters may now be sent, *viâ* Belgium, for 3d. the ½ oz., if prepaid, and if sent unpaid, or insufficiently stamped, they will, on delivery in Holland, be charged 3d. additional. Hitherto the charge has been 6d. the ½ oz. through France. Newspapers are still sent that way, the charge for 4 oz. being 2d.

FOREIGN POSTAL ARRANGEMENTS.—The French Government has for a long time offered to increase the initial weight of letters between France and England from 7½ grammes (or ¼oz.) to 10 grammes, but the British authorities decline the proposal, on the ground that there exists no English weight corresponding with the 10 grammes which is about four-twelfths of an ounce. The *Times'* correspondent is of opinion that a special weight might be created, but that is a suggestion that seems scarcely feasible. The matter is very important, and the present weight ridiculously inadequate to the wants of the two countries; and in case of the slightest overweight the receiver of the letter is mulcted to the extent of 1s. (or 1fr. 20c.), the amount of the double postage less the stamp employed. The initial weight for letters within the limits of Paris is 15 grammes, that is to say, according to the arrangement between the French and English post-offices the equivalent of over ½oz. The French, therefore, not only have our initial weight while we have not theirs, but it is actually the Parisian unit—10 grammes being that of the provinces. It certainly, therefore, seems more reasonable to ask the French office to adopt the ½oz. than to expect the authorities and people of England to adopt the 10 gramme weight. The post-offices of both countries have set an example to all other departments in the way of reform, and it would be a great boon to both nations to get rid of the quarter ounce, which has already disappeared between France, Belgium, Italy, and, we believe, some other countries. Perhaps our Government will not think it *infra dig.* to make another effort, and thus obtain another boon for the English merchant and manufacturer.

* In the department of the Eure.

Money Orders between France and Italy.—The arrangement already noticed in the *Journal* for the payment of small sums through the French and Italian posts, came into effect on the first of the present month. The amount of each order is limited to a maximum of 200 francs, and the tax is 20 centimes per 10 francs, that is to say, two pence on eight shillings nearly. Another important condition is, that the orders are transferable by indorsement. The extension of this excellent arrangement to England can only be a matter of a little time, the difficulty of remitting sums too small for a banker's check being most seriously felt by the poorer portion of the natives of one country residing in the other—and the number of English of small means in Paris and other parts of France is very considerable.

Submarine Electric Light.—Important experiments have been made with the electric submarine light, or "Lantern of Neptune," as, in one case, it has been christened. At Cronstadt, with an apparatus arranged by M. Von der Weyde, and under the superintendence of General Krabbe, the chief of the Russian Ministry of Marine, and General Todtleben, and other officers, the lantern has been used in the operations for opening the channel to allow the passage of the new monitors, and it is reported that at a depth of sixteen feet a diver could easily distinguish objects at a radius of about thirteen feet from the lantern. The other experiments were made at Lorient with the apparatus of M. E. Bazin, in the presence of a commission specially appointed for the purpose by the admiral and maritime perfect of the department. In the first place the power of the light was tried on the great basin, which is more than three hundred feet long, and in which were the *Européen* and another vessel. The report says:—"It may be said that daylight reigned over the whole of the basin, even in the remotest corners. Engineers went over the vessels, and could see all the details perfectly." A mast was erected for trying the effect of the light with regard to signals; the ship *Duchayla* was anchored at a distance of 700 mètres, nearly 2,280 feet from the mast, and another vessel, the *Panama*, at 500 mètres distance. Signals were then made to and fro, the light being thrown alternately on the mast and on the ships with perfect ease. A diver was then sent down into seventeen feet water, and amongst other evidences of the power of the light was the reading of the decimal divisions on a metrical scale specially prepared for the purpose, and thrown down to the man who was at six mètres, more than nineteen feet and a half from the lantern. It is said that the report of the Commission will declare the light applicable for all submarine works, as it has already been found to be in the case of extensive building and other operations. The fish were attracted in great numbers and swarmed around the lantern.

Patents.

From Commissioners of Patents Journal, September 30th.

GRANTS OF PROVISIONAL PROTECTION.

Advertising, means of and apparatus for—2249—L. J. Paine.
Aniline, colouring matters obtained from—2244—J. H. Johnson.
Barometers, scales of aneroid and mercurial—2267—J. B. Huntington.
Blast furnaces—2269—C. Attwood.
Bookslides—2261—J. C. Hunter.
Boots and shoes, cleaning the lower parts of—2287—J. M. Napier.
Bricks, manufacture of—2128—C. Russell.
Carriage axles—2283—R. Richards.
Chlorine, manufacture of—2313—I. Baggs and W. Simpson.
Chromium, manufacture of salts of—2175—J. K. Leather.
Collieries, &c., elevators for raising water and minerals from—2007—A. Alison and J. Shaw.
Concrete, mixing the materials for making—2214—T. D. Ridley.
Cotton, gins for cleaning seed—2303—C. H. Robinson, J. Fryer, and A. Dyson.
Cotton gins, rollers for—2019—W. Richardson.
Distances, instruments for measuring and registering—2247—J. E. Morris.
Dress, fastenings for articles of—1281—J. Edwards.
Dyeing and printing, colouring matters for—2181—W. H. Perkin.
Eggs, removal of the ends of—2220—A. Watt.
Engines, &c., wheels and axleboxes for—1731—St. J. V. Day.
Engines, locomotive—2285—E. Slaughter and F. L. F. Caillet.
Engines, rotary steam and water power—2149—H. Bennison.
Fabrics, wadding, felt, and waterproof—2208—J. Shepherd.
Fencing, spinning or twisting wire for—2020—G. Bedson.
Fire-arms, breech-loading—2144—E. Petito.
Fire-arms, breech-loading—2145—T. Wilson.
Floor cloths, manufacture of—2271—J. B. Wood.
Gasaliers—2259—J. R. Cafferata.
Healds, making or knitting—2232—E. Higham and R. Kirk.
Hydrants or fire cocks—2277—R. Chrimes.
Inks or writing fluids, manufacture of—2223—H. C. Baildon.
Iron hollow ware, manufacture of—2238—S. J. Taylor.
Jacks, roasting—2234—J. M. Fisher.
Lifeboats—2146—J. White.
Lighting, gas and other fluids or liquids for—2050—J. J. Parkes.
Marine steam engines—2231—J. Dean.
Needles, manufacture of—2224—R. Schleicher.
Ovens, construction of, &c.—2253—A. M. Perkins.
Pumps, double action submerged force—2189—A. Moe.
Rags, &c., bleaching coloured—2157—W. L. Duncan and S. C. Child.
Railways, permanent way of—2004—S. C. Hemming.
Railway trains, communication between passengers and guard—2218—A. A. Davis.
Railway trains, communication between passengers and guard—2255—R. T. Hall.
Railway trains, communication between passengers and guard—2307—C. W. Howell.
Shafts or axles, anti-friction bearings for—2240—P. Skeldon.
Ships and vessels, arrangements for propelling—2265—F. Thornton.
Ships and vessels, construction of—2206—W. Coppin.
Ships, cleansing the bottoms of—2281—J. Harrison.
Ships, &c., construction of—2168—T. E. Symonds.
Silk waste, processes for treating, &c.—2297—C. F. M. Jessen.
Skates—2309—H. Rogers.
Steam engines, oscillating—2204—H. C. Lobnitz.
Sugar, manufacture of—2317—R. A. Brooman.
Syphon with a closing apparatus—2242—F. L. de Prebois.
Tar oils, treatment of—2279—D. H. Brandon.
Threshing and dressing machines—2202—A. Wallis and W. Drewett.
Tramways, &c.—2184—W. H. Ward.
Urinals—2194—T. Taylor.
Ventilating, fan to be employed for—2315—E. T. Hughes.
Vessels of war and fortifications, construction of—2167—W. Langham.
Water, machine for forcing up—2273—C. Stevens.
Wheel, screw and worm, &c., for propelling cars, carts, &c.—2155—N. Stubber.
Wheels—2295—R. W. Sievier.
Wind engines—2154—J. T. Hewes.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Bedstead—2263—S. A. Baron.
Bed-table—2262—S. A. Baron.
Buttons, studs, &c., manufacture and fixing of—2325—G. G. Bussey.
Photographic pictures—2347—A. H. P. S. Wortley and W. W. Vernon.
Projectiles—2361—J. Mackay.
Ships, sheathing to iron or steel—2369—G. B. Cornish.

PATENTS SEALED.

643. E. Rowing.	867. F. Weintraud.
804. W. Holbrook.	869. J. Snider, jun.
805. W. Holbrook.	874. A. Rigg, jun.
809. J. Hicks.	875. C. Beard.
810. J. Bullough.	876. J. S. Richardson.
812. A. Prince.	883. F. C. Goodwin.
814. T. Coltman.	889. A. Rodger.
821. J. Hunt.	897. A. B. Brown.
822. J. Capper.	899. J. B. Thompson.
825. E. Lindner.	927. W. Reading.
826. W. Callcott.	950. G. W. Rendel.
827. R. J. Edwards.	959. W. Clark.
828. E. U. Parod.	1002. J. Jones.
837. J. Smith.	1157. J. H. Johnson.
842. E. K. Dutton.	1161. A. V. Newton.
845. J. N. Douglass.	1221. D. West.
847. A. McLaine.	1227. W. E. Newton.
850. J. Platt, E. Spencer, and J. Dodd.	1246. S. Foster and W. Rowden.
856. E. T. Hughes.	1365. A. V. Newton.
861. W. T. C. Pratt.	1424. J. H. Johnson.
863. J. H. Johnson.	1754. J. S. Tucker.
	1826. J. and J. L. Hinks.

From Commissioners of Patents Journal, October 4th.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2418. S. Rowsell.	2464. W. T. Henley.
2462. C. G. Hill.	2466. T. Warwick.
2538. W. Clark.	2482. T. G. Ghislin.
2441. P. A. F. Bobœuf.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2557. R. H. Hughes.	2523. J. M. Napier.
2517. W. Henderson.	2558. J. Parker.
2521. E. Leigh.	2531. P. Kerr.
2522. J. G. Jennings.	

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BRITISH ASSOCIATION, 1864.

On a New Method of Extracting Gold from Auriferous Ores.

By Dr. Crace Calvert, F.R.S.

The following paper was read in the Chemical Section:—

At the present time, when the auriferous ores of Great Britain are attracting public attention, it may be advantageous to persons interested in gold mining to be made acquainted with a new and simple method of extracting gold from such ores, which presents the advantages of not only dispensing with the costly use of mercury, but of also extracting the silver and copper as well as the gold which the ore may contain. Further, it may be stated that the process can be profitably adopted where the amount of gold is small, and the expense of mercury consequently too great. Without entering here into all the details of the numerous (about one hundred) experiments which I made some years since, before I finally arrived at the new method of extracting gold which I have now the honour of communicating to the meeting, allow me to state a few facts which are necessary to give a general view of the subject. If 2·2 parts of pure and finely-divided gold, obtained by the reduction of a salt of that metal, be added to 100 parts of pure sand, and placed in a bottle with a saturated solution of chlorine gas for twenty-four hours, only 0·5 of gold is dissolved. If the same experiment be repeated, but, instead of chlorine water, a mixture of chlorine water and hydrochloric acid be used, 0·6 of gold is dissolved. If, instead of employing hydrochloric acid and chlorine gas, a mixture of sand, reduced gold, and peroxide of manganese, with hydrochloric acid, are placed in a bottle, 1·4 of gold is dissolved; so that it would appear that, under the influence of nascent chlorine, the gold is more readily dissolved than when the same gas is mixed in solution with hydrochloric acid previously to being placed in contact with the auriferous sand. Still these processes leave a great deal to be desired in a commercial point of view, as more than a third of the gold remains undissolved; and the same results are obtained if the chlorine gas be generated by another method, viz., by adding to the auriferous sand a mixture of chloride of sodium, sulphuric acid, and peroxide of manganese. Being convinced, therefore, that nascent chlorine gas was a fit and proper agent for cheaply extracting gold from ores, and that it was only necessary to modify the method of operation, I allowed the mixture of hydrochloric acid and peroxide of manganese, or of sulphuric acid, peroxide of manganese and chloride of sodium, to remain for twelve hours in contact with the auriferous sand; and then, instead of washing out the solution of gold, I added a small quantity of water, which removed a part of the acting agent, and this was made to percolate several times through the sand; by which method I succeeded in extracting from the sand, within a fraction, the whole of the gold. I then repeated the last experiments with natural auriferous quartz, and easily extracted the two ounces of gold per ton which it contained. I therefore propose the following plan for extracting the gold on a commercial scale:—The finely-reduced auriferous quartz should be intimately mixed with about 1 per cent. of peroxide of manganese; and if common salt be used, this material should be added at the same time as the manganese, in the proportion of three parts of salt to two of manganese. The whole should then be introduced into closed vats, having false bottoms, upon which is laid a quantity of small branches covered with straw, so as to prevent the reduced quartz from filling the holes in the false bottom. Muriatic acid should then be added if manganese alone is used, and diluted sulphuric acid if manganese and salt have been employed, and, after having left the whole in contact for twelve hours, water should be added so as to fill up the whole space between the false and true bottoms with fluid. This fluid should then be pumped up and allowed to percolate through the mass, and after this has been done several times the fluid should be run off into separate vats for extracting the gold and copper that it may contain. To effect this, old iron is placed in it to precipitate the copper; and after this has been removed, the liquor is heated to drive away the excess of free chlorine, and a concentrated solution of sulphate of protoxide of iron, or green copperas, is added, which, acting on the gold solution, precipitates the gold in a metallic form. By this method both gold and copper are obtained in a marketable condition. If silver is present in the ore, a slight modification in the process will enable the operator to obtain this metal also. It is simply necessary to generate the chlorine in the vitriol, manganese, and chloride of sodium process, taking care to use an excess of salt, that is, six parts instead of three, as above directed. The purpose of this chloride of sodium being to hold in solution any chloride of silver that may have been formed by the action of chlorine on the silver ore,

and to extract the metal, the following alteration in the mode of precipitation is necessary:—Blades of copper must be placed in the saline solutions, to throw down the silver in a metallic form, then blades of iron to throw down the copper, the gold being then extracted as previously directed. I think the advantages of this process are, 1st, cheapness; 2nd, absence of injury to the health of the persons employed; 3rd, that not only is the metallic gold in the ore extracted (as is done by mercury), but it attacks and dissolves all gold which may be present in a combined state, besides enabling the miner also to extract what silver and copper the ore may contain. I cannot, however, conclude without reminding you of what is generally underrated—that is, the heavy expenses which attend the bringing of the ore to the surface, its crushing and preparation, to render it in a proper state for being acted upon either by mercury or by any other agents.

Measurement of Gas.

In the Mechanical Section Mr. Glover read a paper on the Measurement of Gas. The following is an abstract:—When about fifty years ago coal-gas was introduced, the want of a measure for its sale was at once felt. This was clearly indispensable in the event of its becoming a staple article of merchandise. To meet this want, Mr. Samuel Clegg invented the instrument which, from the circumstance of its measuring part being a drum revolving in water, has been denominated the wet gas-meter. Ingenious in principle, it has been found to have defects in practice. Its chief defect arises from the evaporation of the water, causing constant variation in the measuring capacity of the meter. This variation is acknowledged, even at the present day, to reach as high as from 20 to 30 per cent. There has been no lack of effort to remove this defect. Ingenuity, labour, and vast sums of money have been lavished upon it. Even could the level of the water be preserved at the same plane, the inclination of the meter would cause it to vary in measurement. And were the instrument so made that the sides of its measuring chambers should be at right angles to the plane of the water contained in it, this condition could only be preserved by making the bottom of the meter as perfect a plane as the water, and parallel with it, and the floor or shelf on which it is placed would require to be equally so, and to be maintained so. The measurement also varies according to the amount of pressure of the gas as it enters the meter, this pressure varying from 5-10ths of an inch water-pressure to six times that amount, according to circumstances. These causes of variation are constantly at work, and impart the instability of the water to the measure itself. It is attempted to retard the evaporation of the water by placing the meter in a cool situation; the consequence is, that some of the constituents of the gas are condensed; the water gets thick and tarry; the inner surface of the measuring chambers is coated with viscid substances; layer upon layer is deposited, and the size of the chambers diminished. Wherever the meter is placed the variation is only a question of degree. Should its situation be warm, the evaporation goes on rapidly. To preserve an uniform measurement, Mr. Clegg, shortly before his death, invented a method of floating the drum. The simplicity and theoretical beauty of this invention are apparent; and could the revolving drum be kept perfectly balanced and free from deposit, the water from impurity, the pressure of the gas from variation, it might be hoped that one serious practical objection to the wet meter had been removed. Sudden and unexpected extinction of the lights occur from the float falling in wet meters when there is too little water; and when there is too much, from the water passing over the lip of the spout and excluding the gas. From this cause lamentable disasters have occurred in public assemblies, as in churches and theatres. And surely it is a most unjustifiable addition to the dangers of railway travelling, to expose the signal lights to such contingencies. The interest alike of the public and the gas companies required that the evil should be no longer evaded, but fairly met. The prevailing dissatisfaction, and the antagonism prejudicial to both which it necessarily created, at length drew the attention of the legislature to the subject. The mere fact that gas is not a liquid or solid, but an aëriform body, does not make it less desirable that a purchaser should obtain the quantity he pays for, or that the seller should be paid for the quantity he delivers. If security be given for the just measurement of gallons of oil and pounds of candles, it is equally required for cubic feet of gas. The Astronomer Royal's familiarity with the subject of the Standard Weights and Measures, specially qualifying him for such a duty, and his services to the Exchequer in connection with this subject having been acknowledged as of high value, their lordships applied to him to assist in providing the instruments and apparatus required by the Act. Acting under the authority of the Lords Commissioners, and with the assistance of Professor Miller, of Cambridge, the Astronomer Royal provided a bottle for measuring the cubic foot defined in Section 2. The idea of a legal standard of measure necessarily involves the highest attainable accuracy. Nothing short of this will satisfy either the Legislature or the public. Any amount of error which can be averted is a self-inflicted evil. The subject of weights and measures, even for solids and liquids, is confessedly one of great practical difficulty. The records of the Royal Society abundantly testify how much time, labour, and thought have been given to the solution of those apparently simple questions—What is a pound weight; what is a yard? But in constructing a legal standard measure for gas, the difficulties are necessarily much more complicated. An aëriform body has to be measured; invisible, highly elastic, varying in volume with every barometric change, very complex in its constitution, affected by every change of temperature, liable to condensation, and to be absorbed by water, of which it is also an absorbent. In constructing a standard measure, these various properties required to be taken into account, and the following conditions were considered essential: that the metal for making the bell should be such as would resist the chemical action of the constituents of coal gas and water, that this anti-corrosive substance should readily part with water, and be sufficiently hard to resist change of form, the application of any ordinary forces; that the bell should be a truly cylindrical vessel, having a correct seal engraved upon it, at once legible and durable, to indicate its capacity in cubic feet, and the decimal part of each foot; and that by strict attention to the mechanical adaptation of all the parts of the instrument, and the selection of materials and forms best adapted to their purpose, it should, as a whole, work easily, steadily, and correctly. The graduation of the holders involves nice scientific considerations, and a series of experiments requiring great delicacy and care. Although the cubic foot bottle was accurately adjusted for containing the legal standard or unit of measure, yet there was no method known by which it could be used directly in the graduation of gas holders, or the division into multiples and decimals of a cubic foot. The instrument called a transferer was resorted to, consisting of an upper chamber containing exactly the volume of one cubic foot, and adapted with proper arrangements of cocks and pipes, by repeated discharges of the water, filling the upper chamber, into the lower chamber, to discharge in succession any number of volumes of air, each of one cubic foot, into any vessel properly prepared for their reception. With this instrument, trial upon trial was made, but with no satisfactory result. It was open to serious objections. The filling of the bottle produced agitation of the water, displacing air from the water, and entangling variable quantities of air in minute bubbles, many of which adhered to the inner surface of the bottle. Every means which suggested itself was tried to make it available, but these failing to give a uniform result, it was laid aside.

Analogous methods of transferring the exact cubic foot of air to the gas holders were reorted to, by which some of the objections to the transferer were obviated, and a closer approximation made to uniformity of result. Still this uniformity was not such as to justify their adoption in the division of the scale. Eventually a plan was adopted which was found free from the same liability to error. Instead of using the cubic foot bottle indirectly through the intervention of a second vessel, as had hitherto been done, the second vessel was dispensed with, and the bottle was used directly. Close the opening caused by the withdrawal of the plug with glass; solder a piece of leaden tube to the end of the tap; connect this tube with the gas-holder to be tested; place a cistern below the bottle which has been secured in a fixed position; raise the cistern steadily, without agitation of the water, through the entire length of the bottle until the water reaches the point where the plug of the tap, had it been retained, would have stopped it, the entire volume of air, viz., one cubic foot defined by the contents of the bottle will be found to have been transferred to the gas-holder. Tested by numerous experiments, the results of this method have been invariably satisfactory, and it has removed a difficulty long felt by meter makers in the graduation of their holders for testing meters. To reduce to practice the idea of a machine for the accurate measurement and correct registration of gas, the experience of half a century has shown to be no easy problem. The construction of a good and durable dry gas meter involves a multiplicity of mechanical and chemical considerations, to each of which its due weight must be assigned. A subtile, invisible, elastic, and complex fluid, susceptible of change in condition and volume from very slight variations of temperature and pressure, has to be accurately measured, and the result must be correctly recorded. The instrument is self-acting. It must do its work in a closed chamber, continuously or at intervals, and free from all interference. The parts of the instrument which come in contact with gas must be made of anti-corrosive material, and the material forms and combinations of its different parts must be so accurately adapted as to produce steadiness, uniformity, and correctness in its movements. Whilst gas, having become a staple commodity, one of the necessaries of life, that it may have a real practical value the instrument for its measurement must be produced at a price which will place it within the reach of every class. Realizing these essential conditions, and approaching as near as may be to the accuracy of the standards, the dry gas meter has taken the place to which it is entitled, as a valuable addition to many ingenious and useful contrivances of mechanical science.

Copper Smelting.

Mr. Spence read a paper on Copper Smelting and the means of economising the sulphur evolved in the operation. He said he had for some years directed his attention to this subject, and his aim had been to erect works on sound chemical principles. The first furnace he erected was successful in calcining the small ores with a small expenditure of fuel and labour, with elimination of all the sulphur from the ores if that was required, and it enabled him to send all the sulphur so eliminated into the vitriol chambers as sulphurous acid gas. Very soon afterwards he erected additional furnaces, and all the sulphuric acid made at his works since the end of 1861 had been made from these small ores by similar furnaces. The amount of sulphur wasted in copper smelting, and which could be economised for the use of such calcining furnaces as he had erected, was something enormous. It had been estimated at £70,000 tons per annum, which at the present time would be worth £455,000.

Lighting Gas by Electricity.

Professor W. B. Rogers exhibited an invention by Mr. Cornelius, of Philadelphia, for lighting gas by electricity. It was the first time it had been exhibited in Europe. The electrical apparatus was attached to a common gas-burner. It was an application of the principle of frictional electricity (the apparatus being a modified form of electrophorus), and as soon as the Professor removed a stopper of vulcanite, the friction generated an electric charge, and the gas was instantly ignited. It could be arranged so as at the same instant to light the whole of the burners in a room. It was the invention of a man of little education, who had turned his self-gained scientific knowledge to a practical application.

Proceedings of Institutions.

Glasgow Mechanics' Institution.—On the evening of Friday, 30th September, a meeting of the directors of this Institution was held in the hall, for the purpose of distributing the certificates awarded by the Society of Arts at the last examination. The chair was occupied by Professor Anderson, of the Glasgow University, who took occasion to explain the mode in which the examinations are conducted, for which the certificates and prizes are given. He was glad to say this Institution holds a very creditable place, and had held a very creditable place among such institutions all over the country. It was his pleasing duty now to distribute certificates to the number of 47, and in addition to that three of the Society's prizes had been awarded to students of the Glasgow Mechanics' Institute —the 3rd prize in English Literature, the 3rd in Animal Physiology, and the 2nd in Bookkeeping. Professor Anderson then proceeded to the distribution of the certificates, after which he said that this was now the fourth time in which he had the honour of presiding on such occasions. The certificates which he had just distributed, 47 in number, had been divided into three different sets —7 first, 19 second, and 21 third-class certificates. The number was larger than last year, but smaller than in the first year. The chief difference lay in this, that the number of first-class certificates was not so large as on any previous occasion. In the first year's competition the number of first-class certificates had been larger, in proportion to the number of candidates, than in any other Institution in the country. He thought that, at all events, the position of the Glasgow Institute was respectable, and he trusted that those intending to present themselves at these examinations would aim at the higher class certificates, so that the Institute may in future years more than maintain the position which it has gained. The Institute was only one of four in Glasgow which sent up candidates to the Society of Arts, and it has at all times carried off its just share of certificates, and more than its just share of prizes. Professor Anderson explained that a high standing at the examinations was not merely a pleasing success on the part of the young men who gained it, but that it opened the way to more substantial rewards, as Government situations of considerable value and importance were thrown open to the successful candidates. Two young men had gone from this Institution to Government offices, because of the high standing they had acquired at the examinations, and one young man, partly trained at the Mechanics' Institute and partly at the Athenæum, and who had had the good fortune to carry off the highest honour at the disposal of the Society of Arts (the Prince Consort's Prize), was, he believed, offered a Government appointment, which, however, he refused. Many of the branches of study pursued at the Institute were, he remarked, of special service in the business of life, and he was very glad to find that there were others coming under the head rather of the ornamental than the useful. He was rejoiced to find that here the two branches were combined. We must have something to fall back upon in after years—some pursuit the indulgence in which will lighten our daily toils—such as music and drawing. The tendency in these countries had been rather to depreciate such studies, and to imagine that whilst the useful must be attended to, the ornamental may with safety be

disregarded. He believed that people had now found out their mistake on this point, and was glad to find that in the Institute there was such a happy combination of the two elements.—Mr. R. B. Smith proposed a vote of thanks to the Local Board, coupled with the name of Professor Anderson, for their generous performance of the task of conducting these examinations.—Professor Anderson, in the name of the Local Board, begged to return thanks for the manner in which the motion had been made, and in doing so remarked that the duties of the Board were not of a very laborious character, but involved rather more care and discrimination than labour. The principal labour they had was the setting of papers for the preliminary examination.—Bailie Couper moved a vote of thanks to the chairman, which was carried.

Nailsworth Literary and Mechanics' Institute.—On Tuesday, September 6th, the annual general meeting was held. The chair was taken by the president, M. H. Whish, Esq. The eleventh annual report states that the number of members has considerably increased; the financial condition of the society has improved; the attendance at lectures has been good, and the penny readings have been very successful. The number of members at the close of last session was 176; the number now on the society's list is 223, showing an increase of 47. The only point left to be desired on this head is that there was a larger proportion of members at the ten shilling subscription. The balance due to the treasurer has been considerably reduced during the past year, and this in spite of the unavoidable incurrence of several extra expenses, amounting to £12, four pounds of which have been spent in fitting up the coffee room, and the result has been a great acquisition to the society. The report shows that the receipts for the year have been £181 4s. 5d., the expenses £162 10s. 9d., leaving a balance on the year's account of £18 13s. 8d. in favour of the society, and reducing the old balance from £32 15s. 0½d. to £14 1s. 4½d. The committee believe that there is every prospect of completely clearing the Institute from debt during the coming year, and recommend that £5 be voted for the improvement of the library. The attendance at the society's lectures during the past session has been highly satisfactory. Besides the opening entertainment, there were nine public lectures, five of which were given gratuitously. The penny readings have been eminently successful. The audiences were large, and appeared to be greatly interested in the pieces that were read. The committee believe that the penny readings may be rendered still more interesting by a little more attention to arrangement; and recommend that a sub-committee be formed, whose especial province it shall be to engage amateur readers and musical performers for these entertainments, and also to draw up a few rules for the better regulation of the readings, as to time, and in any other respects that may seem desirable. The coffee room has been much frequented. The games of chess, draughts, and bagatelle have been extremely popular. An excursion took place to Ozleworth-park, the seat of J. Rolt, Esq., Q.C., M.P., whose kindness in throwing open his grounds to the members of the Institute, at a few hours' notice, and under circumstances of great emergency, was gratefully appreciated.

Ulverston Lecture and Scientific Association.—In presenting their fifth report, the committee show that they have endeavoured as usual to provide the members with lectures of a high class. The session opened with a lecture by the Rev. Hugh Stowell Brown, on "Common Sense;" then followed George Dawson, Esq., who gave a lecture on "Ill-used Men;" then came Dr. Spencer T. Hall, with a lecture on the "Origin, History, and Destiny of a Drop of Blood." Professor Grembank as usual gave a night of Readings from Shakspeare and others. James Glaisher, Esq., gave an interesting lecture on Balloons. These were the whole of the paid lectures, some of which were not successful in a pecuniary point of view, but intellectually they were so. In addition to these the society is much indebted to several gentlemen who lectured gratuitously. A lecture on "Intellectual Improvement," by Dr. Barber; "The Struggle and the Victory," by John Johnson, Esq., of Liverpool; "Macbeth," by Mr. Wm. Salmon; "Wants: Real and Imaginary," by the Rev. M. Mosely; "A Visit to Antwerp," by Dr. H. Barber; "Natural History," illustrated by the magic lantern, by H. Field, Esq.; "Lord Bacon," by Mr. R. Pearson; a series of Readings by Messrs. J. P. Morris, R. Pearson, and D. C. Moss; "Geology, and its Practical Results," by the Rev. W. Till; "Taxation as it is, and as it ought to be," by John Noble, Esq., of Liverpool; "Cardinal Wolsey," by Mr. D. C. Moss; "Peace and War," by John Johnson, Esq. a second series of Readings by Messrs. W. Salmon, R. Pearson, J. P. Morris, and J. Cockerton; "Men who have risen from the Working Classes," by Mr. J. Geldart; "The First Traces of Man in Britain," by Mr. J. P. Morris. This last lecture brought the session to a close. This session there is a slight decrease in the number of members, the list at present standing thus:—Honorary members, 5; ordinary, including 12 ladies, 105; apprentices, 12; total, 122. A discussion class was formed for the mutual benefit of the members, but from some unexplained cause it gradually dwindled into oblivion. The committee think this a matter of regret, seeing that the formation of classes for mutual improvement might be the means of keeping the association more alive. The formation of a naturalists' class has often been discussed.

THE APPLICATIONS OF ELECTRICITY.

A grand prize of 50,000 francs, offered by the Emperor of the French, has been awarded to M. Ruhmkorff, and has given rise to a very remarkable report upon the subject in general.

The prize was originally offered in 1852, and its award entrusted to a commission composed of the following gentlemen:—M. Dumas, senator, President; Messrs. Pelouze, Regnault, Rayer, Serres, Becquerel; Baron C. Dupin, Baron Ségnier, General Morin, General Probert, and H. Sainte-Claire Deville, all members of the Institut; M. Reynaud, inspector-general of roads and bridges, and chief of the lighthouse service, and M. Jamin, Professor of Physics of the Faculty of Sciences in Paris.

In 1858, the commission proceeded to the award, and came to the decision that there was no application of sufficient importance to warrant the disposal of such a prize, but petitioned the Emperor to allow the offer to stand good for the next period of five years. The present report announces a notable improvement in the application of electrical power, and awards the grand prize to M. Ruhmkorff. M. Froment has been raised to the grade of officer of the Legion of Honour, at the suggestion of the commission.

In the third place the commission recommend the repetition of the offer of the prize of 50,000 francs, and this recommendation has been acceded to by the Emperor. The report of the commission is from the pen of its President, M. Dumas.

M. Ruhmkorff, it appears, was formerly a workman in the employ of some of the best instrument makers in France, became afterwards a manufacturer on his own account, and finally head of one of the first establishments in Europe. He is essentially a self-educated and self-made man, and, in the words of the report, "worthy to serve as a model to the many intelligent workmen engaged in the manufacture of instruments of precision."

After referring to the discoveries of Ampère, Œrstedt, and Faraday, the report goes on to say:—Every time that the electricity of the pile comes into contact with a conducting wire and produces a current therein; every time that the communication and the current are interrupted, the phenomena which are produced are not confined to such transmission or interruption of the current. The bodies in the neighbourhood of the con-

ductor are influenced. If the wire which receives the current is wound round a bobbin, and this in its turn is enveloped in another bobbin of uncharged wire, each time that a direct current is created or interrupted in the former, a current is produced in the latter in the contrary direction. In multiplying these interruptions or in rendering them more frequent, the inductive coil becomes an electrical apparatus of a special and novel kind, and presents phenomena which resemble those of the plate machine. From the year 1851 M. Ruhmkorff has devoted himself to the construction and perfecting of such apparatus; and he has succeeded in giving his name to it, in raising it to importance in a scientific point of view, and in endowing it with an amount of energy which fits it for the basis of serious applications. The apparatus of Ruhmkorff, then, combines the two forms of electricity which were separated by a long interval, that of the frictional machine and of the pile. The effects of the Ruhmkorff apparatus are well known; it can be charged almost instantaneously; its spark inflames combustible substances, melts metals and the most refractory minerals, and reproduces all the effects of lightning, and pierces without difficulty masses of glass four inches in thickness.

Electricity can now be employed to illuminate glass tubes in such a manner as to be highly useful in mines, or other places where there is danger of explosion; under water, for divers; and in surgery, for throwing light into the mouth or other parts, without producing any sensation of heat. The Ruhmkorff apparatus has been found particularly useful for marking the instant of the departure of projectiles and that of their striking any object, and thereby measuring their velocities. Five hundred have been constructed expressly to inflame the gas used in the machines Lenoir; and it is in everyday use in quarries, tunnels, and other situations for the firing of trains of powder, for which its regularity of action, its great power, and the distance through which it operates, render it peculiarly adapted. The few elements which it requires, stated at three in lieu of a hundred, and its capacity for firing eight or ten trains or mines at the same instant, are also great additional advantages. In 1858 it was employed with great success by Lieutenant Trève, of the French navy, in the removal of the bars formed in the lagunes of Venice; and in 1860 it was with it that the principal fort of the Peïho, in China, was blown up by the firing of eight mines simultaneously, and that the strong iron stockades were cleared from the bed of the river.

The report dwells at considerable length on the application of electricity in the mechanical arts, for purposes of illumination in electro-metallurgy and in surgery.

With respect to the first of these divisions, the report says, that notwithstanding the great improvements that have been made, the "electric-horse" costs at present twenty or thirty times more than the "steam-horse," and that, "as a motor for works requiring power, electricity is therefore yet far from supplying a substitute for steam." But there are many cases in which it is serviceable, such, for instance, as in the machine Lenoir, in which the sudden ignition of gas causes an instantaneous elevation of temperature, first on one side of a piston in a cylinder and then on the other, and thus creating a motor; or for producing, at a given moment, and at a distance, the movement of light mechanical appliances which direct the action of other parts moved by powerful mechanical means, acting in this latter case after the manner of the nervous system in animals, which transmits the orders, and leave to the muscles the task of carrying them into effect. In this way it has been used to throw into action the brakes of railway carriages, causing the impetus of the wheels themselves to retard their own progress; and, acting on the same principle, experiments have been made with the view of making steam boilers feed themselves spontaneously.

Reference is made also to the engraving of rollers by means of a design drawn with non-conducting ink on metallic paper; to the copying of a design from one roller on another, as in the machine of M. Gaiffe; and to the pantographic apparatus of M. Cazelli, which is described as capable of transmitting from one end of France to the other despatches in any language whatever, tracing drawings, or whatever is delineated on a sheet of metallic paper prepared for the purpose, and reproduced on another paper rendered chemically impressionable to the electric current; to the weaving machinery of M. Bonelli, which, although not found to succeed in complicated work, will, it is expected, be eventually applied usefully in other cases.

"But," says the report, "it is in those cases in which the mechanician desires to transmit a feeble force to a great distance, as it were, with intelligence and exactitude, that electricity stands at present without a rival," and it is thus that it is so eminently adapted to telegraphic purposes. M. Dumas dwells very emphatically on the system of Mr. Hughes, the American, which is explained at length; and, looking at the inconceivable rapidity of transmission which is obtained by it, the learned reporter believes that if to the combinations of Mr. Hughes were added the celerity of finger of a pianoforte player, there seems no reason why a reporter should not be able to transmit a speech to Strasbourg, Marseilles, and Bordeaux, while it is being spoken in Paris.

The commission, however, properly points out that the practical application of the wonderful powers of electricity depends greatly on mechanical exactitude, and says that the combinations of Bonelli, Cazelli, and Hughes remained in the condition of mere experiments until M. Froment, a manufacturer of instruments of precision in Paris, undertook their construction.

As regards illumination by electricity, the report commences with a reference to the extraordinary combinations and experiments of Sir Humphrey Davy (after whom it may be mentioned, *en passant*, a street has just been named in Paris), with a pile of 2,000 elements, having a superficial area of more than a hundred square yards, and which M. Dumas himself repeated thirty years since in his public lectures, and then refers to the Bunsen pile, which contained but thirty elements, and to the many unsuccessful experiments made to light towns by electricity, an attempt designated as a mistake, on account of the fact that the value of electric illumination is in great single lights, which are unsuitable to purposes where dissemination is required. Reference is made to the application of the hard residue of the gas retort in place of charcoal; to the production, by M. Jaquelain, of the Paris School of Mines, of an artificial substance cheaper and purer than the former; to the arrangement of M. Léon Foucault, by means of which the light itself regulates its conductors; to Mr. Staite's invention for the same purpose; to M. Serrin's self-lighting regulator; and lastly to the new apparatus invented by M. Foucault, which M. Dumas considers the best yet produced.

The report then arrives at the application of dynamic electricity to the same purpose, and details the results that have been arrived at by means of the scientific apparatus of Pixü, as applied, in Belgium, by Nollet to practical purposes. A Parisian company, the "Alliance," has applied a modification of this apparatus with perfect success in the slate quaries of Angers, in the workshops of the railway of the north of Spain, and many other places. The most important application, however, of the kind has been made at Havre, an electric light having been placed on Cape La Hève, near a light-house of the old kind of the first order. A comparison of the two gives the following results:—The light of the latter is equal to 600, and that of the former to 3,000 carcel lamps, the cost of the oil-light being equal to seven centimes for each unit, while that of the electric light is rather less than two centimes, the expenses of the light-house and the interest on the capital engaged all included.

The report gives special praise to M. Oudry for his

galvano-plastic work on cast and wrought iron, noticed at length in the *Journal** some time since, and the Emperor has rewarded M. Oudry with the Cross of the Legion of Honour.

With respect to medical electricity, the report alludes to the success which Dr. Duchenne, of Boulogne, has met with in the treatment of chronic affections of the nerves and muscles, and to one hundred and forty cases, reported by M. Middeldorf and other surgeons, of the successful treatment of polypi and tumours, by means of platinum wires heated by electricity. (In connection with this important subject the reader is referred to a late notice in the *Journal*† of experiments made by Dr. Nelaton.)

In the conclusions of the report, M. Dumas says, as the chemist declares that there is neither creation nor loss of matter, so the philosopher maintains that there is neither creation nor loss of power; heat, light, magnetism, and electricity are but manifestations of various conditions of an ether in movement, and are transformed one into the other with the utmost facility. Of these forces, electricity has been the most recently studied, and its properties are still the most mysterious, in spite of the grand discoveries which have been made. It may be said, in fact, from the observations made since the commencement of the century, that of all the manifestations of the movements of the ether, those which give rise to electrical phenomena are at once the most delicate and the most ruitful.

REPORT OF THE COMMISSIONERS OF PATENTS FOR 1863.

It appears from this document that the number of applications for provisional protection recorded within the year 1863 was 3,309; the number of patents passed thereon was 2,094; the number of specifications filed in pursuance thereof was 2,068; the number of applications lapsed or forfeited, the applicants having neglected to proceed for their patents within the six months of provisional protection, was 1,215.

The Act 16 Vict. c. 5 enacts that all letters patent for inventions, to be granted under the provisions of the Patent Law Amendment Act, 1852, shall be made subject to the condition that the same shall be void at the expiration of three years and seven years respectively from the date thereof, unless there be paid, before the expiration of the said three years and seven years respectively, the stamp duties in the schedule thereunto annexed, viz., £50 at the expiration of the third year, and £100 at the expiration of the seventh year. The patent is granted for fourteen years.

Four thousand patents bear date between the 1st October, 1852, and the 17th June, 1854 (being the first 4,000 passed under the provisions of the Patent Law Amendment Act, 1852). The additional progressive stamp duty of £50 was paid, at the end of the third year, on 1,186 of that number, and 2,814 became void. The additional progressive stamp duty of £100 was paid at the end of the seventh year on 690 of the 1,183 patents remaining in force at the end of the third year, and 796 became void. Consequently nearly 70 per cent. of the 4,000 patents became void at the end of the third year, and nearly 90 per cent. became void at the end of the seventh year. The proportionate number of patents becoming void, by reason of non-payment, continues nearly the same to the present time.

All the provisional, complete, and final specifications, filed in the office upon the patents granted under the Act since 1852, have been printed and published in continuation, with lithographic outline copies of the drawings accompanying the same, according to the provisions of the Act 16 and 17 Vict. c. 115. The provisional specifications filed in the office and lapsed and forfeited, have also been printed and published in continuation. Printed certified copies of the specifications filed in the office, as also certified copies of patents, and of the Record Book of Assignments of Patents and Licenses, with copies of such assignments and licenses, have been sent, in continuation, to the Office of the Director of Chancery in Edinburgh, and the Enrolment Office of the Court of Chancery in Dublin, pursuant to the Act of 1852 and the Act of 16 and 17 Vict. c. 115.

The work of printing the specifications of patents under the old law, 13,561 in number, and dating from 1711 to 1852, was completed in 1858, and copies thereof are sold in the office, at the cost of printing and paper. Abstracts or abridgments of specifications, in classes, and chronologically arranged, of all specifications of patents, from the earliest enrolled to the present time, are in course of preparation and publication.

The classes already published and on sale at the office, at prices covering the cost of printing and paper, are.—1. Drain tiles and pipes; 2. Sewing and embroidery; 3. Manure; 4. Preservation of food; 5. Marine propulsion; 6. Manufacture of iron and steel; 7. Aids to locomotion; 8. Steam culture; 9. Watches, clocks, and other timekeepers; 10. Fire-arms and other weapons, ammunition, and accoutrements; 11. Paper (Part I. Manufacture of paper, pasteboard, and papier maché); 12. Paper (Part II. Cutting, folding, and ornamenting, including envelopes, cards, paper hangings, &c.); 13. Typographic, lithographic, and plate printing; 14. Bleaching, dyeing, and printing fabrics and yarns; 15. Electricity and magnetism, their generation and applications; 16. Manufacture and applications of india-rubber, gutta percha, &c., including air, fire, and water-proofing; 17. Production and application of gas; 18. Metals and alloys; 19. Photography; 20. Weaving; 21. Shipbuilding, repairing, sheathing, launching, &c.; 22. Bricks and tiles; 23. Plating or coating metals with metals; 24. Pottery; and 25. Medicine, surgery, and dentistry.

The following are in course of preparation:—Preparation and combustion of fuel; Steam engines; Spinning; Railway signals and communicating apparatus; Music and musical instruments; Railways; Hydraulics; Oils, animal, vegetable, and mineral; Lace; Ventilation; Agricultural implements.

Schedule.

An Account of Stamp Duties, received under the Act to substitute Stamp Duties for Fees (16 Vict. c. 5), for the year.

	£	s.	d.
3,309 petitions for grant of Letters Patent, at £5 each...	16,545	0	0
2,301 notices of intention to proceed with application, at £5 each	11,505	0	0
30 notices of objection to the grant of Letters Patent, at £2 each	60	0	0
6 notices of objection to the sealing of Letters Patent, at £2 each	12	0	0
2,095 warrants for Patents, at £5 each	10,475	0	0
2,094 Patents sealed, at £5 each	10,470	0	0
2,011 final Specifications filed, at £5 each	10,055	0	0
57 complete Specifications filed, at £5 each	285	0	0
526 entries of assignments of Patents and licences, at 5s. each	131	10	0
780 searches and inspections, at 1s. each	39	0	0
12,866 folios of office copies of documents, at 2d. per folio	107	4	4
586 Patents upon which the progressive stamp duty of £50 has been paid...	29,300	0	0
212 Patents upon which the progressive stamp duty of £100 has been paid	21,200	0	0
8 duplicate Patents issued in lieu of original Patents lost or destroyed, £5 each	40	0	0
8 petitions on application for disclaimers, £5 each ...	40	0	0
7 caveats against disclaimers, at £2 each	14	0	0
7 new Patents granted upon Her Majesty's Order in Council under the 40th section of the Act (1852), being a prolongation of a Patent granted previous to the Act, at...	35	0	0
	£110,313	14	4

* Vol. xii., p. 205.
† Vol. xii., p. 674.

Balance Sheet of Income and Expenditure for the Year 1863.

Receipts.	£	s.	d.
Stamp duties in lieu of fees	110,313	14	4
By Stamp duties on the sale of prints of Specifications, &c.	1,885	4	6
	£112,198	18	10

Payments.	£	s.	d.
Fees to the law officers of England	9,076	4	0
Their clerks	825	10	0
Salaries of the officers and clerks in the Patent Office...	6,874	0	0
Compensations	4,584	0	0
Current and incidental expenses in the Patent Office ..	4,577	2	1
Cost of stationery supplied by Her Majesty's Stationery Office, books for the free library, and binding, &c.	866	5	7
Rent of offices, rates, and taxes	617	0	0
Messrs. Eyre and Spottiswoode for printing Specifications of Patents, indexes, &c., and lithographer's bills for drawings accompanying Specifications	15,673	5	2
Cost of paper supplied to the printer and lithographer by Her Majesty's Stationery Office	2,504	3	0
Cost of coals and other fuel supplied to the Patent Office by Her Majesty's Office of Works, and furniture and repairs...	649	9	9
Expenses incurred in respect of the Museum at South Kensington	678	15	6
Salaries of officers and clerks for ditto	730	0	0
**Revenue* Stamp duty account as below	20,575	0	0
Surplus Income for the year 1863	43,968	3	9
	£112,198	18	10

* The Act of 1852, in lieu of the old duties upon Patents, imposed a Revenue Stamp duty of £5 upon the warrant of the law officer, £10 upon the certificate of payment of the progressive fee of £40 at the expiration of the third year, and £20 upon the certificate of payment of the fee of £80 at the expiration of the seventh year of the Patent.

The Act of 1853 (16 Vic. c. 5) converted all the fees imposed by the Act of 1852 into stamp duties.

The *Revenue* Stamp duty account for the year 1863 is as follows:—

	£	s.	d.
2,095 warrants of the law officers for Patents, at £5 each	10,475	0	0
586 Patents on which the progressive duty of £50 has been paid at the end of the third year from their respective dates (£10 being *Revenue* Stamp duty and £40 fee stamp duty), 586 at £10 each	5,860	0	0
212 Patents on which the progressive duty of £100 has been paid at the end of the seventh year from their respective dates (£20 being Revenue Stamp duty and £80 fee stamp duty), 212 at £20 each...	4,240	0	0
	£20,575	0	0

LABOURERS' COTTAGES.

The following is from the *Daily News*:—

Our agricultural labourers will soon be better housed. Every speaker at the rural festivals of this autumn, from the Harvest Home to the District Agricultural Association Meeting, has plenty of difficulties to enumerate and describe; so that if we were to read all such speeches, and look no further, we should wonder that a subject so hopeless, a thing so impracticable, should be discussed at all. Yet it is discussed everywhere and on all occasions; and this of itself is ground enough for a strong assurance that whatever is desirable in the case will be done. When it is once agreed, from end to end of England, that any condition of social life is in need of amendment—that it is "extremely serious"—that it is "very urgent"—the matter is sure to be taken in hand before long. If the difficulty lies merely in settling whose business it is to make the reform, or how the change can possibly be afforded, we may be satisfied that the needful thing will soon be done. We are never very long, in our day, in finding out that great mischiefs do not answer, and that it must pay somebody—probably everybody—to change those mischiefs into benefits. Therefore we believe that (the mischiefs of bad cottages being generally agreed upon), our rural labourers are likely to have better dwellings from this time forward than they have ever had before.

And how is this to come to pass? It may be useful, in view of this question, to bring together and compare a few of the sayings of leading country gentlemen who have lately been speaking on the subject.

In one and the same newspaper we find the following. Crowded and stinking cottages are an intolerable evil. This appears in every speech, and is nowhere disputed. As we go on, we learn that landowners cannot be expected to supply good cottages on unremunerative terms:—that labourers cannot, out of agricultural wages, pay a remunerative rent:—that landowners cannot let improved cottages to labourers at a practicable rent, because the tenant farmers regard such an act as an unfair competition for labour:—that it is due to the tenant farmer that his labourers should live near their work:—that it is good for the labourer that he should live near his work, to save a great waste of his strength and time:—that the labourer is a man and a member of society, and likely to prefer living at a distance from his work, on account of the sociability of the town or the village, and that he has a perfect right to please himself in the matter:—that no decent cottage can be built for less than £100; that six per cent. is considered a very fair return for the outlay; and that this is more than rural labourers can pay:—that when cottages are properly ventilated, drained, &c., the tenants are not enlightened enough to value the benefit, but stop up the air-channels with old petticoats, showing that such improvements must wait till the poor people are wiser:—that there is a great danger impending—the danger that labourers earning 10s. a-week will be invited to the factory districts to earn twice or thrice as much:—that there is no fear that rural labourers will ever leave their homes, their landlords, and their employers, on any inducement whatever:—that it is unpatriotic and cruel to encourage country people to emigrate, far from their natural protectors, and the gentry and the farmers who were their early friends. There is much more, but this will do. Here we see the rural labourer in a remarkable position. His earliest friends and best protectors are the landowners and farmers in his neighbourhood; yet from them—his employers—he receives wages which will not afford the rent of a decent house, and the landlord must not give him better accommodation for the money, because the tenant farmers will not allow it; and the tenant farmers are not to require the cottager to live near his work, because he must please himself about living in society or in a retired situation. But we need not show up the inconsistencies and absurdities of the statements hazarded. We need only ask whether the labourer is not hardly used if he may neither have a wholesome house for the rent he can pay, nor wages which will pay for a wholesome house, nor freedom to accept an invitation to earn better wages. Turn the case which way we will the labourer is the afflicted party. This will not do, and it cannot go on. Since the Society for the Improvement of the Dwellings of the Labouring Classes, last May, passed seven resolutions on how the thing might in part be done, it has been clear that the rural class will not be left to be bandied about between the landlords, the farmers, and the parish officers. We are shown what the Legislature can do, and therein we are shown what the Legislature cannot do, and somebody else must therefore undertake.

If it is true, as we believe, that the improvement must be sanctioned by commercial principles, it follows that the wages of rural labour must be determined by the same principles—whether the pay is to be all in money or partly in house-room. As for the cost of good cottages, it varies largely in different parts of the country. Lord Lyveden said at Wellingborough last week, that nothing short of £100 will build a good cottage; and this is true in many places, while in certain districts, where the materials are present and the conditions favourable, a thoroughly wholesome and comfortable dwelling of four rooms and extras can be supplied for £60. However this may be, on any spot, the dwellings must yield the interest of the capital and the cost of repairs. None but the low speculators of whom we hear so much would desire a

larger return than this. Where is it to come from? No doubt from the income of the inhabitants. If the dwellings were in existence they would be eagerly applied for as soon as the neighbourhood had seen how well it answers to pay a somewhat larger rent, to escape sickness, inability to work, doctors' bills, and the endless waste of food, clothes, and furniture which takes place where damp and dirt are present. If, after all, the wages are not enough to pay a rent of from £4 to £7, the wages will rise. All indications point to such a rise of wages. The labourers themselves are rising in intelligence and character as the art of tillage advances. Where agricultural machinery is employed, the men are like a different race from their fathers; and the economy of time and force by the use of machinery at once improves the pay of the men, women, and the boys employed. In such districts there are always people who perceive that it answers to build new cottages, or to put such as exist into good condition.

If arbitrary impediments are in the way, they must be removed; and if certain facilities are needed, they must be supplied. The remainder of the law of settlement, universally condemned as it is, will have to be repealed; and the Act by which Irish gentry have been, since 1860, enabled to borrow money to build cottages may be extended to England, according to the second of the seven resolutions referred to above. In a rising district, where agriculture advances, and wages with it, professional builders will erect dwellings, if the landowners and farmers, and the labourers themselves, are not beforehand with them. It is not an enterprise which need go a-begging, when its bearings and prospects are once understood.

Yes, even the labourers themselves. The co-operators are obtaining a footing in the agricultural districts, and both farming and cottage improving flourish in their hands; and there are building societies, good as well as bad, which exhibit the tempting example of labourers living in homes of their own. In all directions, perhaps, the prospect is more hopeful than in districts where gentlemen at the after-dinner table rise to tell the prize-taking labourers at the bottom of the room, as Lord Lyveden did recently, that it is a shocking thing that their family dwellings are so bad, but that neither the landlord can be required, nor the farmer expected, nor the labourer enabled, to mend the case. If there is any thing elsewhere so dreary as this it is where, as in Buckinghamshire the other day, the rural labourers were informed that it was a shocking thing to go where they would earn more, while no promise of prosperity was offered as an inducement to stay. One of the most comfortable things said was at that meeting, when Mr. Hubbard, M.P., related that two of his farming tenants had offered him five per cent. on any outlay he would make in improving the dwellings of their labourers. He agreed; and here was a sound practical beginning. When such a step is taken, others follow; and before long there will be no further hearing for croaking philanthropists who stand up to preach that some things of vital consequence must be done, but that there are no possible means of doing them.

Fine Arts.

Discovery of Antiquities at Rome.—A man sinking a shaft for a well close to the Campo dei Fiori, came upon some stone slabs at a depth of 30 yards, placed at an angle, and bearing the letters F. S. C. These slabs were found to cover a colossal bronze statue, 18 feet in height, of Hercules, perfect except the feet, which are wanting, and the occiput, the whole strongly gilt. The club, too, on which the statue leant when in an upright position, is wanting, but the left hand bears the apples of the Garden of the Hesperides. Its value is estimated at upwards of £4,000, and as the line of stone slabs continues, it is thought not improbable that another statue may be concealed there. It is conjectured that this valuable relic was purposely overthrown and buried previous to some barbarian incursion, and arched over for safety, by the inscription F. S. C., *factum Senatu consulto* (done by decree of the Senate). The feet were probably broken off in overthrowing it, but there is no trace of the pedestal. The back of the head, as the statue lay on its back, has probably been lost by corrosion. The discovery seems to point at the existence of a temple of Hercules at this point, or, with still greater probability, of Flora.

Pompeian Discoveries.—A number of statues have lately been found amid the ruins of this strangely interesting place; they are of bronze and of marble, and have a high interest in an artistic point of view. Some of the former have enamelled eyes, and all have necklaces, bracelets, and anklets of precious stones. These statues decorated a beautiful temple consecrated to Juno, and which is itself in an excellent state of preservation. A large number of skeletons were found on the pavement of this temple, and it is conjectured that many of the unfortunate Pompeians had, at the commencement of the great eruption, prostrated themselves before the shrine of the goddess, whom they hoped might preserve them from the impending danger. These interesting statues are now being reproduced in terra-cotta. That part of the town which is now being laid open is in a wonderful state of preservation; the pavement of the streets is described as being equal to anything that exists at the present day in Europe. The material used was lava in irregular blocks, but fitted with great nicety, and it appears that when a block became broken or separated from the adjoining one, it was the custom to fill in the interstices and connect the parts by means of iron cramps, instances of such repairs being found in all quarters of the town. This kind of pavement is attributable to the invention of the Carthaginians. The Pompeian streets were provided with side walks, formed in some cases of mere beaten earth, and in others of lava and of small bricks laid in mosaic patterns. These footpaths were raised generally more than a foot from the road, and the pedestrians were protected by posts or by a low parapet. The streets were often so narrow that a man could step across from one sidewalk to the other, but in the wider streets and broad places a curious arrangement existed to prevent the Pompeians from soiling their shoes and clothes, flat-topped posts or stepping stones being placed at intervals in the road, so that a person on foot could step from one side to the other without descending. Such an arrangement, however convenient to the foot passenger, would have been incompatible with a large carriage traffic.

Manufactures.

North London Working Classes' Industrial Exhibition.—The formal opening will take place on Monday next, the 17th inst. At 3·0 p.m. the Chairman (Earl Russell, K.G.) will be conducted to the platform by the committee and officers. On the chairman being seated, the Psalm C.—"All people that on Earth," &c., harmonized by Dr. S. S. Wesley, will be sung by the choir. The report will then be read by Mr. W. J. Watts, Hon. Secretary; at the conclusion of which the chairman will inspect the Exhibition, during which time Dr. S. S. Wesley (of Winchester Cathedral) will perform on Willes's grand organ. On the chairman returning to the platform, his Lordship will deliver an address, and declare the Exhibition open. A special ode, composed by W. H. Bellamy, Esq., and set to music by Dr. S. S. Wesley, will be sung by Miss Louisa Pyne, Miss Leffler, Miss Elliot Galer, Mr. Lewis Thomas, and chorus. Prayer will be offered by the Rev. Robert Maguire, M.A., Incumbent of Clerkenwell, during which the committee

earnestly request perfect order and silence. The inaugural ceremony will conclude by the choir and assembly singing the National Anthem, the solo by Miss Louisa Pyne. On same evening there will be a concert, and a portion of the afternoon music will be repeated. The Exhibition will be open daily from 9 in the morning till 5 in the evening, admittance sixpence; from 7 till 10 in the evening, admittance twopence. On Wednesday, October 19th the children of the Band of Hope Choir will attend and sing during the evening. On Thursday, October 27th, the Tonic Sol-Fa Choir will attend and sing under the direction of Mr. Sarl. The band of the Caledonian School will attend on one evening during the time the Exhibition is open.

The Working-man's Industrial Exhibition Movement.—This movement has, it appears, spread to Birmingham, as a meeting was recently held in that town for the purpose of considering the proposal contained in a letter from Mr. Joseph Everard, to hold an industrial exhibition in Birmingham, of a similar character to that now being held in London. After some formal business, a deputation was appointed to wait upon the Mayor to ask for his co-operation, and also to ask for the use of the committee-room of the Town Hall for a public meeting.

Iron Manufactures in Corsica.—The iron works of Toga have greatly increased the trade and importance of Bastia, in the immediate vicinity of which town they are situate. The cast iron produced is much esteemed, and is converted into wrought iron of superior quality, steel, &c. Messrs. Petin, Gaudet, and Co., of Rive de Gier (Loire), the proprietors of the works, furnished to the French Government the armour-plates for the frigate *La Gloire*, and other iron-clads. In the recent trials of armour-plates in England, the rolled plates delivered by this firm were very favourably mentioned for the superior quality of the iron, which, no doubt, came from the Toga forge, though the manufacture of the plates was inferior. The Toga works were originally established in 1840, and after undergoing various vicissitudes of fortune, came into the hands of the present proprietors in 1854, since which time their operations have greatly increased in importance, and are yearly becoming more extensive. At present the works possess four blast engines, three of which are constantly at work. The machinery in use is of a total of 330 horse-power, distributed as under:—

Blast engines	180 h. p.
Motive ,,	100 ,,
Hydraulic lifts	50 ,,
	330 ,,

Two hundred workmen are employed at the works alone. From 600 to 900 tons of Newcastle coal are consumed annually, but the ore is fused with charcoal, 22,000 tons of which are used per annum. Half of this quantity is imported from Sardinia, the remainder is procured from the forests of Corsica. Thirty vessels are in the continual employ of the company, and 70 more are freighted, as occasion may require, in the year. The average annual quantity of iron ore now used amounts to about 30,000 tons, containing 60 per cent. of ore, and the average quantity of cast iron produced may be reckoned at from 17,000 to 18,000 tons. About 700 tons of hammered iron, of excellent quality, are also produced yearly at the works. The ore is imported from the islands of Elba and Sardinia, and from Spain and Algeria. The firm have lately acquired an iron mine in Sardinia, and will, in future, make use only of the Elban and Sardinian ores.

Steel Manufacture in Bordeaux.—Among the few manufactories of this district there is one which has recently attracted some attention; it is the steel manufacturing establishment, situated on the River Lisle, an affluent of the Dordogne, known under the name of "Les Acieries de Saint Seurin." In it three different systems of treating the metal are employed. Firstly, the cementing process; secondly, the system of Bessemer; and thirdly, the old process of melting in small pots a mixture of steel and iron in order to obtain different qualities of cast steel. The principal manufacture is that of bar steel, both rolled and hammered, for all purposes. In many industries the use of steel is rapidly superseding that of iron, consequently there is an increasing demand for large blocks of steel worked down to different shapes by the steam-hammer. The manufactured articles are chiefly confined to springs for railroad and other carriages, the quantity turned out being estimated at from 80 to 100 tons a month; and rails, conical bolts and balls, for the French Ordnance Department, are also being manufactured. About 400 hands are employed in this establishment, of which ten are British subjects. The coal consumed up to the present time has been almost exclusively British, amounting to about 12,000 tons annually; but measures are to be taken to employ the French coal from the department of the Aveyron, as the quality has greatly improved of late, and the price is considerably below the English. About 2,000 tons of English pig iron, chiefly from Cumberland, are annually converted into Bessemer steel, and 200 tons of bar iron are imported from Sweden for cementing purposes. But here, again, a change is contemplated, for the intention of the company is to treat French iron in place of British. No English capital is engaged in the concern. That represented by the establishment is £68,000, besides a loan from the French Government of £48,000, which has been laid out in buildings and machinery.

Linen Manufacture in Ireland.—A company has been formed at Cork for introducing the linen manufacture into that city, and they recently held their first meeting. A building is now being erected at Blackpool, a short distance from the city. The chairman said that the company were entirely independent of the flax-growers of the South, and could carry on the business of their mills successfully if there were not a stalk of flax grown in Munster; still, they were most anxious to co-operate with them. It was the opinion of a great many good judges that the flax grown this year in the South is of excellent quality, though it has been in many cases insufficiently watered, and submitted too long to the action of a burning sun. This has greatly lessened the value of the article. They had purchased from a farmer the produce of one acre, which realised £33. The returns for the growth of flax in Ireland for the last two years show an increase for Ulster of 70,000 acres, or three times more than the entire extent of the flax crop in all the east of Ireland. In Ulster in 1863 the crop covered 207,000 acres, this year it is 278,000, while in the other three provinces it is only 23,688. The inference is that the Ulster farmers, being the best judges, would not have extended the cultivation of flax if they did not find it profitable.

Commerce.

Flax.—The Cork papers give an account of the opening of a flax-market in that city on the 5th October, and it seems to have been a good beginning. The market was held at the southern end of the Corn-market Trustees' premises, and consisted of 19 loads of unscutched, and about 140 stone of mill and hand-scutched flax. The latter came principally from Limerick, the neighbourhood of Mallow, Clonakilty, and Rosscarbery, while the former was brought in from the districts about Cork. Some of it was superior, and showed signs of considerable care and attention having been bestowed on it in the various processes of preparation for market, but other lots were badly prepared, and looked as if they had had but very little steeping. Of competition there was not much, there being only two or three buyers present, but competent judges expressed it as their opinion that in each case the full value of the flax was given. The figures at

which the different loads were sold are as follows:—5 at £8 a ton; 1 at £7 15s.; 1 at £7 5s.; 5 at £7; 6 at £6 10; and 1 at £6.

Foreign Trade at Canton.—A comparison of the returns of the past with the preceding year will show a decrease generally in the trade of the port, but by no means to the extent anticipated. To begin with imports, the total value in sterling for the year 1863 is estimated at £2,281,354 against £2,412,515 in 1862, showing a decrease amounting to the sum of £131,161 in the past year's trade. As regards the causes of this decrease, the falling off must be attributed as much to failure in supply as to failure in demand, the rise in piece goods, owing to the American supply of raw cotton ceasing, having brought the foreign into competition with the native manufactures, and as the Chinese prefer the latter, from being heavier and of more lasting quality, they abandon the former the moment its price places it beyond the denomination of being a cheap article for clothing. Comparing, for instance, the imports of cotton manufactured goods for the two preceding years:—

		1862.		1863.
American drills	pieces	30,965	......	2,196
Shirtings, grey	,,	126,529	......	48,829
Ditto white	,,	49,788	......	44,695
T cloths, 36 yards	,,	4,570	......	6,055
Ditto 24 ,,	,,	20,601	......	28,802
Cottons dyed—				
Figured, plain	,,	21,627	......	20,100
Damasks	,,	3,667	......	3,006
Printed	,,	11,382	......	15,812
Muslins	,,	510	......	1,984
Handkerchiefs	dozens	28,057	......	27,121
Velveteens	pieces	1,711	......	4,813
Cotton velvets	,,	1,060	......	2,625
Yarn	piculs	20,334	......	14,819
Cotton, Bombay raw	,,	35,928	......	488

A large deficiency in plain goods appears, and particularly in the article of Bombay raw cotton, whilst in fancy goods the difference is rather in favour of 1863. This latter may be accounted for by the heavy stocks on the manufacturers' hands, which rendered their going off beneficial to the holders, and therefore the prices were not affected in a ratio proportionate to that of the plain manufactures. But if the imports of woollen manufactures be taken—

		1862.		1863.
Blankets	pairs	3,510	......	3,849
Broad cloths	pieces	157	......	148
Camlets, English	,,	3,993	......	4,331
Do. Dutch	,,	610	......	697
Do. imitation	,,	644	......	1,761
Habit and medium cloths	,,	566	......	1,496
Flannels	,,	271	......	352
Lastings	,,	3,441	......	4,641
Long ells	,,	8,660	......	11,863
Sp. stripes	,,	9,007	......	7,448
Woollen and cotton mixtures	,,	8,769	.....	5,769

It will be seen that the balance is generally in favour of 1863, and this arises from the fact that wool has not been subjected to the fluctuations of raw cotton, or deficiency in supply, and therefore, if anything, there has been an improvement, and not a deficiency, in this branch of the import trade. The result of these comparisons tends to show that the decrease in the value of the import trade of 1863, namely, £131,161, is owing as much to foreign as to native influences; and that, under such circumstances, the past two or three years will afford no criterion of the capabilities of Canton as a mart for foreign manufactures. The import of opium in 1863, as compared with 1862, differs in amount but little. The temptation to smuggle so valuable an article, and the facilities the coast affords for that purpose are so great, that in all probability what passes through the Canton Custom-house is for local consumption only, and so it will be until the Chinese authorities establish a preventive service. The value of the export trade may be taken at £3,862,039, against £4,060,746 in 1862, showing a decrease of £198,707. This may chiefly be attributed to the short supplies of tea, the export in 1863 being less than in 1862 by at least 7,418,890lbs.; but, less though it be, it is more than was anticipated, the opinion being at the close of last season that little or no tea would come again to Canton. But notwithstanding this, not only did it come down, but the tea-men held out for high rates, and generally obtained them. As regards silk, the export of the two years, 1862-63, is much on a par.

Cotton in Texas.—According to late accounts from Texas it appears to be expected that the growing cotton crop of that State will be as large this year as ever it was, owing to the amount of negro labour that has been transferred thither from Louisiana, Mississippi, and Alabama, the region of the war movements. Picking is now in progress, and the probable yield is represented to be more than 450,000 bales. It is asserted that all the other States in the Southern Confederacy combined will not make an equal amount this year. Texas has suffered, and still suffers, from the war, but her losses are nothing compared to those of other Southern States, or as measured by her own abilities. There is said to be a great leak on the frontier of Texas, through which large quantities of cotton are finding their way into Mexico, and thence to Europe. It is asserted that persons in Texas hold nearly 500,000 bales of last year's crop of cotton, which, added to the supplies within the lines of Arkansas and the parishes of Louisiana bordering on the Red River, would give a total probably of at least a million of bales.

Metrical System in Buenos Ayres.—The government of this province has just determined that the use of the decimal metrical system be rendered obligatory in the province of Buenos Ayres from the 1st January, 1865. It is probable that this example will be promptly followed by the other provinces of the republic.

Commerce of the Fiji Islands.—Two Australian companies, composed of merchants of wealth and position, have invested capital largely, and formed extensive and important establishments in these islands; one company alone having erected machinery for preparing oil from the cocoanut at an expense of over £7,000. In these works the nut is ground, sweated, pressed, and caked by steam machinery of the most improved description. The quantity shipped in the half year ending June, 1863, was 450 tons, valued at £22 per ton. Other and newer resources of the country, such as cotton and coffee, have also worked into encouraging existence. Among the exports in the half year have been 320 piculs (133lbs. each) of beche de mer, or tripang, valued at 48s. the picul; 1,700 lbs. of tortoise shell at 10d.; and 1,250 lbs. of mother of pearl shell at 4d. the pound. A few enterprising men have devoted their attention to the growth of coffee; 12,000 trees are under cultivation, half of which are expected to bear fruit this year. Experience has shown that the climate and soil are admirably adapted for the successful production of cotton, and a considerable number, in proportion to the white population, have got little plantations; 7½ tons have already been shipped. Half a ton of tobacco had been exported to Sydney; the plant grows luxuriantly in the islands. Sugar, arrowroot, and other products are used for island consumption. There are now about 3,000 sheep in the islands landed from Sydney. This importation has been a decided success, and generally they are doing well. As the sheep are being introduced by men of capital, it is not improbable this interest will largely increase in a few years. There are as yet but a very limited number of horses and cattle, but of swine there are 5,000 head.

French Coast Fisheries.—Notwithstanding the disadvantages at which the fishermen on that part of the coast are placed in comparison with parts nearer to Paris, such as Dieppe, the carriage of fish from which place is

one-third less than from Calais, Boulogne, and Dunkirk, forty additional boats were built and launched at Calais during the seasons of 1862 and 1863. The number of boats engaged in the fishing trade at Calais and the adjacent villages, is 135, employing 682 men. The herring fishery must be regarded almost as a monopoly for Boulogne; the value of the take of herrings by the Calais fishermen during the last season having been only £1,801, whereas at Boulogne it amounted to £93,110. The port of Gravelines, following the example of Dunkirk, has increased its trade in the Iceland fishery.

Wool Imports.—The total imports of sheeps' wool last month were 56,457 bales, and of goats' wool 2,715 bales. Of the sheeps' wool 10,811 bales were Australian, 6,540 South African, and 12,187 East Indian. A good deal of the Indian, North African, and Turkish wools are now received at Liverpool.

Orchella Weed.—The consumption of this dye lichen in France and Germany would appear to be on the increase. About 17,000 cwt., shipped in each of the last two years from the republic of Ecuador, appears to have gone to the Continent.

Colonies.

Progress of Victoria.—In 1851, when Victoria for the first time obtained a legislature, there were but eighty-one manufactories in the colony, although the first settlers landed on the banks of the Yarra in 1835, although the first newspaper of the colony was published in 1838, and the bounds of the city of Melbourne were set out in 1843. Ten years after the first regulations for the sale of land in Port Phillip were issued, in fact, the whole of the fellmongeries, mills, boat-building establishments, &c., every workshop, in short, to which the name of manufactory could be given, did not exceed the small number already stated. Last year the aggregate number was 708, and when the examination is carried back it is found that the rate of progress has increased rapidly of late years. The reason why is easily given. The growth of wool and the scraping of gold from the earth no longer engrossed the attention of the producing classes. It cannot be said that legislation has done much to bring about the change. This colony is still without the oil from the olives, of which there was some expectation two or three years ago, and the cultivation of raisins and currants, rice and hops is still behindhand. The increase of manufactories is due to the efforts of the colony to become its own supplier of articles of import requiring greater capital and skill in their manufacture than those simpler products which have been favoured by the legislature as special industries. The preservation of beef for export is not a new industry in this colony, but it is now packed in casks of colonial wood and colonial make. Cattle and sheep are not only sent to New Zealand, but Melbourne assumes to Dunedin the position which Aberdeen maintains to Smithfield, as its purveyor of fresh as well as cured meat. Steamship building is also another industry not new, but the combination of iron and wood in the product of the shipyard is new, and the first vessel built in the colony on this principle was launched not long since. There is steam machinery at work supplying cordage of all kinds, from the smallest to the largest sizes. A steam collier, the first ever engaged in the trade, now plies between Melbourne and Newcastle, and a second of very much larger dimensions is about to make her trial trip. The colony, no longer dependent on Boston, now manufactures the ice which is regarded as indispensable in summer. Chemistry has also been applied to other arts, and by its aid are produced on the banks of the Yarra a variety of products indispensable in a manufacturing community. Boots are made partly, at least, by machinery, and altogether of colonial material. From portable caps and specifics for disease in sheep (and the last forms no inconsiderable item in the table of exports), Victoria has advanced to cigars, which are said to rival those of Havannah and Manilla. No longer finding it necessary to resort to the London markets for the finest description of binding and book-work, this colony will soon also be independent of Europe as regards printing paper, the machinery for the first paper mill being now in course of importation.

Australian Sugar.—A Queensland Cotton Company have recently exhibited a splendid sample of sugar-cane grown on their plantation. The cane was pronounced by competent judges as equal to the growth of any part of the world, and it has arrived at maturity in something less than ten months. In Queensland, the prospect of sugar cultivation on a profitable scale is said to be becoming every day more manifest.

Revenue of Queensland.—The following is a statement of the consolidated revenue of the colony of Queensland, and of the special funds paid into the Treasury at Brisbane, during the quarter ending 30th June, 1864, compared with the corresponding period of 1863:—

	1864.			1863.		
Customs	£38,650	10	8	£31,066	18	11
Land Revenue	14,986	11	2	16,907	12	8
Postage	3,465	11	9	2,670	19	1
Licences	7,754	14	8	4,843	7	3
Fees of Office	2,178	11	6	1,453	1	1
Fines and Forfeitures	251	17	11	313	13	9
Rents (exclusive of land)... ...	97	16	8	72	18	9
Pilotage, Harbour Dues, and Fees	491	12	6	507	7	4
Civil Service Supply Fund ...	335	3	3	......		
Electric Telegraph Receipts ...	1,368	11	5	1,151	9	0
Miscellaneous Receipts	2,681	10	8	708	7	5
Special Receipts	6,003	16	3	3,063	10	5
	£78,266	8	5	£62,759	5	8

Showing an increase in the total of £15,507 1s. 9d.

Electric Telegraph in Queensland.—The establishment of telegraphic communication between Brisbane and Moreton Bay has been most successfully accomplished. The work was commenced on the 28th of June. The most favourable place for starting the connection between Stradbroke and Moreton Island having been decided upon, it was found that, in order to avoid the flats and sand-banks, about 1,800 yards more cable would be required here than was expected; and altogether about four miles of cable were yet to be laid. It is not intended to use any portion of the cable which remains after laying the necessary quantity between Cleveland and Dunwich, as it is not thought desirable that any splicing of the cable should take place. The landing of the necessary apparatus was found very difficult and laborious, owing to the nature of the wide beach that extends from Dunwich into the sea. It was, however, successfully accomplished. The land line from Lytton to Cleveland, and from the north to the south side of Stradbroke Island, is being rapidly completed, and it is expected that, simultaneously with the arrival and laying of the remaining portion of the cable, it will be ready for the transmission of messages.

Railways in Queensland.—The works on the railways are progressing favourably. A branch line is being made from the new storehouse at North Ipswich to the recently constructed railway wharf on the north bank of the Bremer, on which the whole of the rails, rolling stock, stores, and plant, will be landed. The first section of the railway from Ipswich to Bigges Camp (21 miles) is to be ready for public traffic by the 1st June, 1865, but by Christmas next locomotive engines will be running upon the line, employed in carrying rails, ballast, contractors' materials, &c. So soon as the Loan Bill is passed, the Government will proceed with the construction of the extension of the railway to Dalby, which it is hoped will be completed by the 1st January, 1868, or under three and a half years from the present time. The surveys of the line from the Toowoomba to Warwick are nearly completed. Although the country through which this line will run is very broken, and will be troublesome to the engineers, the gradients and curves will, generally, be unobjectionable.

The Revenue of Natal, for 1863, was estimated at £99,928, and it realised £118,343. The excess arises from a general increase of the various items of revenue, Customs' duties £5,000, and transfers £3,000, being the chief items. The revenue for 1865 has been estimated at £137,145, being an increase over that estimated for this year of £32,000, and £23,000 over the actual receipts of 1863. This large increase is based upon the actual receipts of 1863, together with the progressive increase of former years, the reports of the collectors of revenue, and the receipts of this year. The expenditure, as usual, has been made to tally nearly with the revenue.

New South Wales Revenue.—A comparative statement of the Consolidated Revenue of New South Wales, and of the special funds paid into the Treasury at Sydney, during the quarters ended 30th June, 1863, and 30th June, 1864, respectively, shews that the total revenue proper for the quarter ended 30th June amounted to £337,511 15s. 6d.; for the corresponding quarter of 1863 the receipts reached £450,978 6s. 2d. There is, therefore, a decrease in the quarter of £113,466 10s. 8d., or 25 per cent. The heads of revenue which show a decrease are the Customs duty on spirits distilled in the colony, gold, land revenue, licenses, fines and forfeitures, and miscellaneous receipts. Those which show an increase are Mint receipts, postage, commission on money orders, railways, electric telegraph receipts, pilotage rates, and tonnage dues. The decrease in the quarter's revenue is chiefly owing to the falling-off in the Customs; the decrease as compared with the corresponding quarter of 1863 being £93,859, or nearly 42 per cent., and on duty on spirits distilled in the colony there is a decrease of £21,315, or 83 per cent. The gold revenue shows a decrease of £2,303, but on the Mint receipts there is an increase of £2,810, in consequence of large quantities of gold having been sent there from Victoria and New Zealand for coinage. The land revenue shows a decrease of £4,441; the receipts for the quarter ended 30th of June, 1864, being £42,516, against £46,956 for 1863. The postage receipts exhibit an increase of £2,511, and the commission on money orders an increase of £227. Under the head of licenses there is a decrease of £1,631, but from fees of office there is a small increase of £31, and from fines and forfeitures a decrease of £593. The amount of rents exclusive of land exceeds the corresponding quarter of 1863 by £585. The receipts from railways show a satisfactory increase of £3,455, or 13 per cent., but from the electric telegraph receipts there is only the paltry increase of £15. From pilotage rates and harbour dues there is an increase on the quarter of £1,544, and from tonnage dues, Newcastle, an increase of £539. The rates under the Chinese Act amount, for the second quarter of 1864, to £70, against £60 for 1863. Under the head of miscellaneous receipts there is a decrease of £700. In this return is a new entry, viz., the proceeds of sale of Treasury bills applied in payment of service of 1863 and previous years, under Act 27 Vic. No. 8, £204,907 19s. 11d., and this sum is carried out by itself as a decrease. Under the head of special receipts, there is an increase of £20,431 3s.; the receipts for the quarter ended the 30th of June, 1864, being £35,105 15s. 11d. against £14,674 12s. 11d. for 1863. For the first quarter of the year 1864 the total revenue proper was £290,305, and this, together with £337,511, the receipts for the quarter ended the 30th June, will make the revenue for the half-year amount to £627,816. For the same period of 1863, the revenue reached £788,016. The decrease in the half-year is, therefore, £160,200, or 20½ per cent.

The Alpacas in Australia.—A Sydney paper states that Parliament having determined last session that the flock of alpacas, brought six years since from South America by Mr. Ledger, should be disposed of, arrangements were made for the sale of the animals at Wingello, the property of Mr. Edward Payten, who for the last twelve months has had charge of the flock. Sir John Young, who was accompanied by the Premier and the Minister for Lands, attended the sale, at which there were about 150 persons present. The flock, which numbered 307, was divided into lots of from four to eleven animals, the majority of the lots consisting of four females, one pure alpaca, and one wether. The whole of the animals were in very good condition. The auctioneer, before commencing the sale, referred to the circumstances attending Mr. Ledger's enterprise, and also to the fact that the experiment made to introduce alpacas into Victoria had proved a failure, the whole of the animals having died. The sale was then proceeded with, but there did not appear to be a disposition on the part of the buyers to give the price that was expected by the Government, who were not prepared to let the animals go at a sacrifice. After unsuccessfully offering several lots, only three of which found purchasers, the auctioneer was instructed to close the sale. Subsequently, however, some other lots have been sold, comprising altogether forty-seven animals, for which the Government have received £1,068 15s. Although the sale was unsuccessful, the amount realised will be considerably more than the cost of the management of the flock for another year, and in the meantime there will be an increase far exceeding the number of alpacas disposed of, as no less than 107 of the females are reported to be with young. The Government have, therefore, sustained no loss by the sale. Amongst the purchasers were the Superintendent of Auckland, the Acclimatisation Society of Victoria, the Acclimatisation Society of New South Wales, and that of Auckland.

The Imports of Natal in 1863 were £473,333, being an increase of £23,000 over 1862, and the exports for 1863 were £154,000, or 21 per cent. over 1862. The increase in the export of ivory was about 80 per cent., on wool 30 per cent., and on sugar 50 per cent., these being the three great staples. The amount of sugar consumed in the colony is also very considerable. In the items of cotton blankets and sheets, in 1863, a falling off has taken place, which may be accounted for partly by many being made into coats, and also by the idea prevailing that the Customs dues on these articles were likely to be reduced. On beads there was in 1863 an increase of 9,000 lbs. weight over 1862. Under the item of picks there is a falling off of about 2,000 picks, which was more than probably made up for by the number of hoes, which are highly taxed. The increase in the importation of spirits for the year 1863 was 15,000 gallons; nearly a gallon a piece for every man, woman, and child. In woollen blankets there was an increase of 4,591 pairs, value £1,800, notwithstanding the high tariff and its evasion by blanket coats.

Publications Issued.

The Past and Future of Architecture (*Le Passé et l'Avenir de l'Architecture*), by the Duc de Valmy. 8vo. (Michel Lévy, Frères, Paris).—The Duc de Valmy is well known as an architectural connoisseur, and generally as an amateur of the Grecian style, but in the present work he has taken up the subject from a broader basis, and he has thus contributed to the art literature of the day with M. Viollet-le-Duc, M. Cesar Daly, and other writers, intent on, if possible, reforming public as well as artistic opinion with respect to the very important questions of art education and scholastic dogma.

An Essay on the Principles of Painting, by Jean Restout, painter in ordinary to Louis XV., 8vo., Caen.—M. de Formigny de la Londe has discovered and published this little work by a painter who enjoyed considerable reputation a century ago. The history of Jean Restout has been made known to the world by M. de Formigny and the *Société des Beaux Arts* of Caen. There were two Jean Restouts, the elder being the nephew and pupil of Jouvenet; the younger became a member of the Royal

Academy of Paris in 1717, and fourty-four of his works are catalogued by his editor. Of these, the gallery at St. Cloud possesses a picture of "Arethusa flying from the pursuit of Alpheus;" and in the Louvre are a "Consecration of Saint Paul," and "Christ healing the Cripple;" other examples are to be seen in the museums of Rouen, Tours, Caen, and in the Hotel de Ville of Alençon. The work of Jean Restout indicates a man of broad and critical mind, who looked upon painting as a serious art, and demanded of the painter an amount of study for which, unfortunately, few have at once the time and the inclination. He says a good painter should have a fair acquaintance with geometry, perspective, anatomy, mechanics, geography, and music; with physics, in order not to offend against the effect of nature; with the characters and passions of men; with sacred as well as profane history; and should know the poets, the habits and customs of all the ancient people, their fêtes, games, sacrifices, and funerals; their architecture, furniture, arms, dresses, and equipages. The remarks of the writer on the fundamental necessity of good drawing are trenchant and pointed:—"Before attempting composition," he says, "the young artist must know how to draw well; for the former includes the idea, the colouring, the chiar'oscuro, and the sentiment of the picture. . . . . Artists generally paint as they draw." This is a sharp hit at slovenly painters, who fancy they can paint out or over their original faults, but one can hardly say it is too severe. It is evident that Jean Restout was a sharp disciplinarian, and, considering the condition of art at the time in which he lived, this proves him to have been a man of a decidedly original and self-relying turn of mind.

Notes.

Archæological Discoveries.—Two interesting monuments have been discovered near Alatri, in the Campagna Romana. This town, of Pelasgic origin, and celebrated for its Cyclopean walls, is situated on the top of a mountain, and being at the time of the Romans ill provided with water, the Censor L. Betilienus Varus, as a celebrated inscription tells us, caused an aqueduct, 340 feet high, to be constructed between Alatri and the neighbouring mountains; it being expressly stated that he built it with arches, and provided it with strong pipes. The present researches ordered by Pope Pius IX., in order to renew the supply of water to the town, have led to the discovery of a large portion of the old aqueduct. From the survey made by Father Secchi, it appears that the lowest point of the aqueduct lies 110 metres below the highest point of the town, a figure which coincides with the 340 feet of the inscription. Here, therefore, there is an aqueduct built 160 years before Christ, in the shape of a reversed syphon under a pressure of eleven atmospheres. It is difficult to say how much water was conveyed by this aqueduct, but it was evidently sufficient for the consumption of the town, since the piers of the arches measure no less than five feet nine inches in breadth. The total length of the syphon is about six kilometers. The other discovery is a field under which a complete system of drainage was executed by means of long pipes made of brick clay, and on an average a foot and a half in diameter. They are now stopped up with sediment, and are 2½ metres below the surface of the soil. This field was probably the parade ground mentioned in the inscription as having been laid out by Betilienus, whose attention to the interests of his city was well rewarded, since he was twice appointed censor, and a statue was erected to his honour.

Canadian Fish.—A correspondent of the *Athenæum* desires to draw the attention of the Acclimatisation Society to the celebrated "white fish" of the Canadian lakes, especially of Lake Michigan and the Manitou Islands, the acknowledged excellence of which fish, with its northern habitat, would seem to point it out as a most valuable addition to our northern lakes of Cumberland and Scotland, now almost valueless; whilst the difficulty of transporting the ova from the Canadian lakes to England would be much less than that experienced in the case of bringing the Silurus from the Argisch to our shores.

Oyster Consumption in Paris.—Notwithstanding the high price at which they are sold (generally from 8d. to 10d. a dozen), it has been calculated that 7,000 to 8,000 baskets are daily emptied in Paris. Every basket contains 150 oysters, so that 1,200,000 are daily consumed there.

Fishing by Electric Light.—The use of electricity, as a submarine light, is developing rapidly. In the last number of the *Journal* the application of the light to nautical purposes and in submarine works was referred to; its use in sea fishing is also of interest. It is well known that fish, like moths, are attracted by light, and to be fascinated by it. Fishing by torch or other light has been long practised on the French as well as other coasts. The boats carry a skillet at their prow, and a blazing fire is kept by means of fir cones and resinous woods, but this is only one of the many modes in use. In 1857, Mons. J. Atonguia de França-Netto, an engineer of Dunkirk, made experiments in the Gulf of Finland, setting himself the following problem:—To obtain a light that should illuminate the water to the depth of 50 to 200 yards, and which should not be disturbed, like the boat beacons, by the movement of the waves. He made use of a submarine electric light, and in one case four men took a thousand pounds weight of the finest fish in forty minutes, or as much as twenty or thirty would have obtained in the ordinary manner. Having proved that a submarine light affected the fish in the same manner as one above the waves, the next thing was to obtain a lamp that would support the pressure, and the director of the famous glass-works of Baccara has produced for the purpose crystal globes nearly twenty inches in diameter, a centimetre, or two-fifths of an inch, in thickness, and weighing upwards of fifty pounds. Subsequent experiments, some of which were made by order of the French Government, have clearly proved that all kinds of fish are attracted by the light, and that when they have approached within a certain distance they seem powerless to quit the spot, and hover about the spot till captured or driven away. Mons. De França-Netto has invented a new kind of net, or trap, to use with the light, and both have been tried on the coast of England as well as of France. Means are being taken to apply the system on an extensive scale.

Waste of Silver in Photography.—MM. Davanne and Girard have addressed a series of papers to the Academy of Sciences on the subject of photography, making some curious revelations with regard to the waste of precious metals in the operation. For instance, the silver alone which is employed for photographs in Paris amounts to several millions of francs. Now, as only 3 per cent. of the silver employed remains on the photograph, 97 per cent. will continue to be lost unless some method be found for recovering it. MM. Davanne and Girard, who make this startling announcement, propose that plates of copper be put into the argentiferous liquid, whereby in the course of three or four days the silver will be precipitated in a spongy state.

Correspondence.

North London Working Classes' Industrial Exhibition.—Sir,—In our *Journal* of September 2nd you inserted a letter of mine on the above subject, in which I gave a sketch of the rise and progress, so far, of the movement. That which was then in a comparatively incipient condition, is now an accomplished fact, and the Exhibition will be opened on Monday next, the 17th inst., at 3 p.m., by Earl Russell.* I expressed in my

* See page 752.

letter a pretty confident expectation that the invitation to exhibit would be extensively responded to, but I had no idea that the applications for space would so far exceed the limited amount then at the disposal of the committee, that, instead of contenting themselves with the modest dimensions of the minor Agricultural Hall, they would be compelled to take the larger one. This has, however, proved to be the gratifying result, and the public will be both surprised and pleased to find in that great building articles of British local industry suitably arranged, far exceeding in interest anything of the kind that has hitherto been exhibited in the metropolis. In my former letter I said that "the workmen had gone about their great project in a workmanlike way," and this will be found to be eminently the case. The guarantee fund has, without solicitation on their part, arrived, I believe, at a total beyond £400, and ranks among the subscribers to it such well-known and respected names as Lord Shaftesbury, the Chancellor of the Exchequer, Miss Burdett Coutts, Assistant-Judge Bodkin, Alderman Lusk, Messrs. J. A. Nicholay, Harry Chester, Samuel Morley, and many others equally eminent, besides a very large number of their own body. The financial committee, however, have not been tempted by this handsome resource in case of need, to incur any unnecessary pecuniary obligations. The central committee (a numerous body) have given their valuable services gratuitously, and the directors of the Agricultural Hall Company have placed the great hall at their disposal on very liberal terms. Much vocal and instrumental talent has also been freely offered and accepted for the opening ceremonial, and Earl Russell will, on that occasion, be well supported. It is intended to distribute prizes (none pecuniary) and testimonials, but the precise nature and value of the former must depend on the surplus means placed at the disposal of the committee, when the Exhibition is finally closed. I hope, however, that under any circumstances, some of the more wealthy well-wishers to movements in this direction will be disposed to assist this fund by special contributions. The gentlemen who, at the request of the central committee, have undertaken the delicate and important duties of adjudication, will only be too happy to find that their desire to give extensive encouragement to skilled and other workmen, is not circumscribed by limited financial resources.—I am, &c., Thomas Winkworth.

Canonbury, October 11, 1864.

Patents.

From Commissioners of Patents Journal, October 7th.

Grants of Provisional Protection.

Aerial navigation—2299—M. A. F. Mennons.
Air, &c., steam engines for blowing, &c.—2192—J. T. Crosland.
Artificial fuel—2276—J. H. Johnson.
Atmospheric pressure, &c., apparatus for propelling by—2210—Sir J. S. Lillie.
Boots and shoes, manufacture of—2246—G. Haseltine.
Bottles, stoppers for—2385—N. Thompson.
Boxes, cases, &c., construction of card board, &c.—2268—W. Austin.
Boxes, safety match and fusee—2289—A. Figge.
Bricks, &c., kilns for drying, burning, &c.—2270—T. R. Crampton.
Brushes—2292—J. Vero.
Cables, manufacturing telegraphic—2341—A. V. Newton.
Candles, manufacture of—2339—W. Palmer, jun.
Cements, &c., fire resisting—2320—E. Young.
Chromic acid and chromates, manufacture of—1362—F. O. Ward.
Cigars, manufacture of—2319—J. H. Johnson.
Door locks—2367—A. J. Adams.
Doors, windows, &c., alarum applicable to—2284—W. Lea.
Engraving, process of—2190—P. E. Placet.
Eye protectors, manufacture of—2337—H. Vale.
Fabrics, embroidering woven or spun—2301—A. Higgins.
Fibrous materials, spinning and winding—2288—J. Smith.
Fibrous substances, bleaching—2230—H. Potter.
Fire-arms, breach-loading—2308—R. A. Brooman.
Fire-arms, construction of—2383—J. Jongen.
Flour mills—2212—L. F. Goodbody.
Guns, gun carriages, and projectiles—2226—G. Clark.
India-rubber, driving straps and tubes of vulcanised—2256—M. L. J. Lavater.
Iron and steel, manufacture of—2278—F. Yates.
Lamps, burners for—2327—I. Watts, jun.
Lightning conductors—2254—A. Bertsch.
Lubricating, apparatus for—2314—J. L. Courcier.
Lubricators—2266—S. Bennett.
Malleable iron, manufacture of slabs or blocks of—2304—W. P. Struvé.
Metal, apparatus for cutting or shearing—2323—S. Laing.
Metal, rolling, bending, and circling plates of—2343—J. Todd.
Mines, lubricating the axles of carriages for conveying coals from—2258—J. G. Hey.
Motion, continuous rotary—2272—L. Colombe.
Nails, spikes, &c., manufacture of—2351—W. Whittle.
Newspapers, &c., contrivance for cutting open—2274—C. Brown.
Paper, apparatus for damping—2200—W. Clark.
Phosphuret of iron, &c., manufacture of—2294—R. A. Brooman.
Photographers, envelope frames for the use of—2300—J. B. Schott.
Photographs, cases or receptacles for—2373—K. H. Lane.
Pipes and cigars, obtaining light for—2286—D. Tamet.
Pitch and spirituous oils, separation of, from matters—2359—L. Alexander and W. B. Nation.
Porcelain, glass, &c., ornamentation on—1981—W. Clark.
Railway signal apparatus—2312—F. Hovenden.
Railways, permanent way of—2305—W. Clark.
Railways, propelling trains on—2257—T. Moy.
Railway trains, communication between passengers and guard—2250—W. Chubb and S. Fry.
Railway turn-tables—2275—M. D. Jeffreys.
Ribbons, &c., weaving—2296—R. Flude.
Screens and sieves—2363—J. Hill.
Sewage matters, utilisation of—2329—T. and T. F. Walker.
Sewing machinery—2196—A. V. Newton.
Ships, &c., protecting the sides and bottoms of—2387—T. J. Denne.
Steam boilers, preventing incrustation in—2252—A. V. Newton.
Steam engines, &c., lubricator for the cylinders and valves of—2248—R. Townsend.
Telegraphs, batteries and electric printing—1720—R. A. Brooman.
Telegraphs, printing by electricity for—2260—J. H. Simpson.
Threads or yarns, manufacture of—2306—W. Wilkinson.
Ventilators, construction of hoods for—2264—R. Holt.
Vessels, casks, &c., fermenting, charging, &c.—2222—J. Williams.
Volatile minerals, &c., distillation of—2282—J. H. Burns.
Warming apparatus, portable—2353—R. Hattersley.
Wet gas meters—2310—E. Smith.
Wood, machinery for cutting—2198—H. Grafton.
Worts, &c., mashing and cooling—2298—W. Laurence.

Inventions with Complete Specifications Filed.

Cotton bales, labels or tags for—2397—G. Haseltine.
Harvesting machines—2442—G. T. Bousfield.
Ores, &c., breaking and grinding—2396—G. Haseltine.
Petroleum, &c., adapting casks to retain—2430—W. S. Cowles.

Patents Sealed.

877. J. Picking.
878. D. Moseley.
881. N. Wood and J. Stockley.
882. E. Pratt.
886. R. Thatcher.
892. J. Howell.
893. J. H. Simpson.
895. J. Nisbet.
904. W. E. Gedge.
905. T. C. Jones.
910. F. A. P. Pigou.
913. T. Chamberlayne.
914. J. Lillie.
915. M. L. Peters & W. Harkes.
918. A. J. Fraser and F. Squire.
919. W. Gadd, jun.
926. A. Audigier.
928. J. C. Evans and J. C. Thompson.
931. J. Neilson and J. Gillies.
932. T. W. Miller.
934. J. Cope.
935. P. A. le Comte de Fontainemoreau.
936. J. Bullough.
937. T. Steven and C. Batty.
939. F. Browett.
941. H. Higgins.
942. S. Moore.
943. G. A. Tremeschini.
946. A. H. A. Durant and W. H. P. Gore.
947. T. L. Scowen.
968. A. W. Smith.
977. G. Burstall.
992. A. V. Newton.
997. W. Clark.
998. J. Abraham.
1005. J. G. Jennings.
1006. J. G. Rollins.
1007. J. G. Jennings and M. L. J. Lavater.
1008. A. Leighton.
1014. J. C. Rivett.
1015. W. Clark.
1032. J. J. Smyth.
1062. E. J. W. Parnacott.
1129. A. V. Newton.
1606. W. Perks, jun.
1662. J. W. Jones.
1774. G. Davies.
1785. A. Wyley.
2028. A. B. Childs.

From Commissioners of Patents Journal, October 11th.

Patents on which the Stamp Duty of £50 has been Paid.

2486. J. Tweedale.
2496. T. Hughes.
2499. A. Chaplin.
2524. J. J. Russell.
2511. S. Bremner.
2507. W. Catford and J. S. Wheatley.
2508. H. Willis.
2533. L. Christoph, W. Hawksworth, and G. P. Harding.
2535. J. Downs.
2555. A. V. Newton.
2531. C. W. Felt.

Patents on which the Stamp Duty of £100 has been Paid.

2541. W. E. Newton.
2552. J. Combe.
2566. J. Warburton.
2556. J. T. Pitman.
2574. T. Grubb.

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TABLE OF CONTENTS.

Announcements by the Council.

Notice to Institutions.

A copy of a Bill, containing brief particulars of the Examinations, has been forwarded to each Institution. This should be suspended in the Reading-room, or some other conspicuous situation.

NORTH LONDON WORKING CLASSES INDUSTRIAL EXHIBITION.

This Exhibition was formally opened by Earl Russell in the Agricultural Hall, Islington, on Monday last, in the presence of an immense concourse of people, all of whom were admitted by tickets at the prices of 2s. 6d. and 1s. each. The noble Earl arrived at the hall at 3 o'clock, and was conducted to a platform by the committee of officers. On his taking the chair, the ceremony commenced by a choir of 1,000 voices singing the Old Hundredth Psalm, accompanied by the organ, which was played by Dr. Wesley, organist of Winchester Cathedral and College.

Mr. Watts, the hon. secretary, read a report of the managing committee, composed of working men, stating the circumstances under which the Exhibition had been set on foot. They were encouraged, they said, to undertake it from the success which attended a Working Man's Exhibition in the south of London, and from a conviction that there was much talent among the working classes which lay dormant for want of fitting opportunities for its exercise and appreciation. They eventually resolved to form a North London Exhibition, including the districts of Clerkenwell, Islington, St. Pancras, St. Luke's, Hoxton, St. Andrew's (Holborn), and Bloomsbury, but not excluding exhibitors from other parts of the metropolis should the committee have sufficient space at their disposal. It was to consist of objects manufactured by the exhibitors, either as specimens of skilled workmanship, or examples of self-taught handicraft, and they had been greatly assisted in carrying out the project by local committees. They at length placed themselves in communication with the directors of the Agricultural Hall, who entered into the scheme in a friendly and encouraging spirit, and offered them the use of their large hall upon liberal terms. With the aid of Mr. Le Neve Foster, the Secretary to the Society of Arts, they appointed adjudicators to award the prizes from among the council of that Society. The committee referred, in passing, to the success attending the guarantee fund for carrying out the objects of the Exhibition. The amount promised, if needed, was £350, £50 of which had been guaranteed by Miss Burdett Coutts, and £100 by Mr. Samuel Morley. The exhibitors were 866 in number, and the articles shown by them occupied 5,930 ft. of wall, 2,012 ft. of counter, and 1,750 ft. of floor. The classification adopted was as follows:—1st, professional workmanship; 2nd, amateur productions; 3rd, inventions and novel contrivances; 4th, mechanical models; 5th, architectural, marine, and ornamental models; 6th, artistic objects; 7th, ladies' work of all kinds; 8th, miscellaneous articles. These classes are thus represented:—Class 1, skilled, 233; 2, amateurs, 98; 3, inventions, 91; 4, mechanical models, 56; 5, marine, 30; and ornamental, 75; 6, artistic, 165; 7, ladies' work, 75; 8, miscellaneous, 85. It was impossible to refer to all who had kindly assisted in the undertaking, but special mention was made of Miss Louisa Pyne, Miss Leffler, Mr. Galer, Mr. Thomas, Dr. Wesley, Mr. W. H. Bellamy, and Mr. Glenn Wesley, for their kind and gratuitous services in the musical department.

At the conclusion of the report, the Chairman inspected the exhibition. On his return to the platform,

Earl Russell said, he had to congratulate them on the exhibition which he had just seen. It had given him the greatest satisfaction to observe the works of skill and industry of the North London working classes, and they deserved the highest credit. It afforded him pride and pleasure to be the fellow-countryman of men who had so employed their time, who had exhibited the greatest ingenuity in the works that they had performed, and in that manner have done credit to the country to which they belong. Those who first conceived the thought of this Exhibition of Industry did but justice to the industry of their countrymen, and he congratulated them on the great success which had already attended their efforts. It was thus that this country gave another proof that the working classes of London are, as he believed, the highest in the world, the most distinguished in the works that they perform, the most ready to accomplish anything that might be set before them, and thus make this great community that which it ought to be—the head of the civilized world in all those works which betoken civilization and progress. He was happy to accede to the proposal when a wish was expressed that he should preside at the opening of this Exhibition, and he must say that he had

no conception that the works of industry which were to be shown would betoken so much skill and show such beautiful results of the operations of labour.

A special ode, appropriate to the occasion, written by Mr. W. H. Bellamy, and the music of which was composed by Dr. Wesley, was then sung by Miss Louisa Pyne, Miss Susan Pyne, Miss Leffler, Mr. Elliot Galer, Mr. Lewis Thomas, and the choir. At its conclusion prayer was offered by the Rev. Robert Maguire, M.A., Incumbent of Clerkenwell; and "I know that my Redeemer liveth," was sung by Miss Louisa Pyne.

Mr. Digby Seymour, M.P., proposed a vote of thanks to the Chairman. He said, if anything could enhance the admirable arrangements of the committee under whose auspices the work had been undertaken and carried out, it was the selection of the noble and illustrious person who had presided at the opening ceremony. When they looked back on the career of Lord Russell, there was no public man, he thought, who had a higher claim on the gratitude of the working classes. During a long public life his name had always more or less been identified with the welfare and progress of the people, social and political, and no man had done more in his time to unshackle commerce and promote free trade, the benefits of which were now experienced in every grade of society. His labours had also tended to give a material impetus to the intellectual development of the working classes by the establishment of a cheap press. He concluded by proposing that the thanks of the meeting be tendered to Earl Russell for presiding at the opening ceremony of the Exhibition.

The motion having been seconded by Mr. George Cruickshank, was carried with acclamation.

Earl Russell, in returning thanks, said he had himself been a working man from an early period of a long life. He remembered that when a measure was brought into Parliament by Sir Robert Peel for promoting freedom of trade with regard to many articles of art and manufacture, many of those whom it affected came to him (Earl Russell) and complained that while they were exposed to competition, and while their trade would be thrown open to all the nations of Europe and the world, the bread which they ate was taxed, and they wished him to oppose the measure. He then told them that in his opinion no such injustice could long continue; that if trade was thrown open to the competition of the whole world corn would not be taxed for many years, but that all would have the benefit of free trade. And so accordingly a few years afterwards the corn law was repealed. With that example before them he might well say, that while the working classes showed their present industry and skill whenever any question arose in which their rights and privileges were concerned, whatever was just and for the common benefit was sure to be sanctioned by Parliament in the end. They might depend upon it that this was a country in which, by means of discussion, by means of the Press, by means of Parliament, by means of public opinion expressed in a thousand ways, truth at last would gain the supremacy, and, under God, every evil would be abolished.

The choir and the assembly then sang the National Anthem, Miss Louisa Pyne taking the solo parts.

There was a concert in the evening, at which portions of the music used at the opening were repeated.

The committee decided at the outset not to offer pecuniary premiums. They are, at the same time, desirous that the prizes shall be worthy mementoes of the occasion, and valued by the holders as marks of distinction. The adjudicators are Mr. Thomas Winkworth, Mr. Peter Graham, Mr. D. H. Clark, Mr. G. F. Wilson, Mr. J. A. Nicholay, Mr. Digby Wyatt, and Mr. Le Neve Foster.

The Exhibition is open daily from 9 in the morning till 5 in the evening, admittance 6d.; and from 7 till 10 in the evening at a charge of 2d.

The number of paying visitors on the three days, Monday, Tuesday, and Wednesday, amounted to 39,213. Of these, 20,116 entered on Wednesday.

PRIMARY EDUCATION IN FRANCE.

General Morin, Director of the *Conservatoire*, recently delivered an address on this subject before the French Institute, when presiding at an important meeting of the "Five Academies." The following is a translation of the most interesting portions of this address:—

After having shown the interest which the public takes in the question of primary schools, and referred to the law of 1833, in which he pointed out the defects, the speaker showed the melancholy state of France, as compared with that of other countries, with regard to popular instruction. "We know," he said, "that in the whole of Germany and Switzerland, whatever may be the form of government or religion, law and custom both make primary education compulsory. The father of a family is never allowed, to the detriment of society, to deprive his children of early intellectual food, any more than of food for the body. It is also recognised everywhere that society ought to provide it for those children whose parents cannot pay for it for them.

"Definite laws and regulations establish this obligation. A special and strict watch is exercised to insure its accomplishment, which is further provided for by graduated penalties, which are, first, admonition from a magistrate or special authority; then a fine; and lastly, if necessary, imprisonment. These rules are as strictly observed in the Swiss Republic as in the Empire of Austria. The obligation is not limited to frequent attendance at the primary school from the age of six to that of fourteen years, but it is also extended to Sunday schools up to the age of sixteen or eighteen, unless the young man can prove that he is engaged in a higher class of studies, or can show a certificate from his spiritual director that he has learnt all that is taught in the school.

"It is instructive to notice that, in no way, does the obligation imposed on the father, to give his children primary instruction, interfere with his authority, nor with the choice of what he has them taught, since the parents are perfectly free in the choice alike of masters and of methods, and are only obliged to prove that their children really receive instruction. The fact of the education being obligatory does not imply that it must be gratuitous, as those opposed to this system aver; it is like a tax on the citizen in favour of society, as well as on the father for his children; and he is only excused from paying it when it is beyond his means.

"Further, primary instruction is so perfectly considered as a social duty, that those parents who have their children taught at home, are, as well as the other inhabitants, obliged to pay the educational tax until their children have obtained the age of sixteen years. In Prussia all heads of families have equally to subscribe for the salary of the schoolmaster, whether they have children or not. In Switzerland there is, in the canton of Zurich, a beneficial law which imposes on every bride coming to dwell in the commune, as well as on every new household which is set up, the obligation to make a wedding present to the treasury of the school, the minimum of which is fixed."

General Morin here quoted a passage from M. Cousin on the necessity of instruction for a free people, above all for a people where universal suffrage exists, and he then showed how compulsory instruction might be established. "Experience shows that it is not as difficult as one would think to oblige even all the children of a community to attend the primary school. The municipal and ecclesiastical authorities can exercise great influence in this respect, and obtain the desired result. Legal authority, exercised in so legitimate a cause, is readily accepted even in countries which are the least prepared for it. For instance, when the Prussian Government took possession of the Duchy of Posen, which then counted a million of inhabitants, and had only twenty primary schools, it introduced the obligation of attending the new schools which it established without the least resistance being offered, and

now every one there can read. In every place where it has been perseveringly insisted upon, such an obligation has been readily accepted, and has rapidly become a custom; we must allow, however, that its complete execution has sometimes met with difficulties which could not be immediately surmounted. In places where the habitations are very widely scattered, and the means of communication are difficult, as well as where the state of morals is low, real obstacles arise which must be taken into account. Thus, in Austria, while the real attendance at the schools is in the provinces of high and low Austria, of the Tyrol, of Bohemia and Moravia, 98·5 per cent. of the number of children, the proportion is reduced to 84 per cent. in Styria, to 72 per cent. in Carinthia, to 55 per cent. in Hungary, to 34 per cent. in Venice, and even to 20 per cent. in Croatia.

"But it is right to notice that there is this peculiarity connected with the diffusion of knowledge in the Empire of Austria, that the people of which it is composed speak nineteen different languages or dialects, so that it is necessary almost everywhere to teach in two different languages, German and the maternal dialect. We can also understand that the principle of nationalities is not much liked by a government which has so many different countries under its rule. In spite of these natural obstacles, and the difficulty of getting isolated populations to join in an intellectual movement, the principle universally exists. So that the exception astonishes us, when it does not present itself as the evident consequence of special circumstances. Thus the colonel of a regiment in one of the little German States, having found, in a contingent of 400 men, four who could not read, the fact was considered so extraordinary that an inquiry was instituted to discover the reason.

"Proofs of the success of the law are furnished by various statistics, which at the same time show the importance of the results obtained. Thus the commercial statistics of the Grand Duchy of Baden show that amongst those condemned to various punishments, that is, among the worst of the population, in 100 individuals of either sex, there was only an average of two men and five women who could not read or write. In Saxony, according to an official document, in 1,741 rural schools the average number of children which ought to attend them is 137 for each school, and the number of actual pupils is the same. Two schools, however, only have one pupil; the greater part have more than the legal number, from the presence of strangers who are not included in the census. In the towns of the same kingdom, which have 275 schools, the result is the same.

"In Prussia the number of children who go by choice to the primary schools, as compared with those who are compelled to attend, is 97·8 for the boys, 97·1 for the girls, giving 97·4 for the average.

We have not yet exact statistics of the schools in France to show how many children have really been at them every day, in summer and in winter. We cannot, therefore, make a comparison with regard to the attendance, analogous to that which can be made in Austria. This hiatus will soon be supplied by the documents which the Minister of Public Instruction has had collected, and then only shall we be able to judge the effects of the attendance being compulsory or free. And, what is still more important, the government will be in a position to recognise more precisely those departments in which its action may be more specially exercised to remove difficulties and overcome local resistance.

"But although attendance at the schools may be insured by the action of the law, it may still be asked whether the result obtained is really satisfactory, and what is in fact the per-centage of young people able to read and write amongst those who are compelled to attend the schools, compared to those of the same age who are not so compelled. Our knowledge on this subject is not so complete as one could wish. However, a few examples may be given.

"In Bavaria, amongst the young soldiers called to arms in 1864, the number of those who could only read and write imperfectly was an average of 8 per cent. In Prussia, the statistics of recruiting show that in 100 recruits arriving at the corps, there was only an average of three who could not read and write. In Saxony, the average number of those who can neither read nor write for the years 1847, 1848, 1851, and 1852, is 16·5 per cent. of uneducated.

"If we compare the results obtained in Germany with those which are carefully collected every year in France by the Minister of War, we are forced to acknowledge the inferiority of France in this respect, and the slow progress which we are making in primary instruction. Taking each year from 1828 to 1862 inclusive, it appears, taking the statistics of recruiting throughout the whole of France—

1st. That out of 100 men of 20 years of age, in 1828, there were 53, or more, who could not read nor write.

2nd. That at the time of the promulgation of the law of 1833 on primary instruction, there were 46 out of the 100 who were thus ignorant.

3rd. That after this beneficent and popular law had been in execution for 29 years, in spite of the continual pecuniary supplies given by the State, there were still in 1862 more than 27 per cent. of men of 20 years of age who could neither read nor write.

"If we represent graphically the results of this statement, we obtain a curve which may be said to give the geometric law for the decrease of ignorance. The melancholy slowness with which the number of young people who can neither read nor write decreases, is thus shown, in spite of the increasing resources that the communes, the Departments, and the state never cease to contribute to this fundamental part of public instruction. We see, in fact, that while the sum devoted by the State to primary instruction had risen from 100,000 francs in 1829 to 4,797,000 francs in 1861, that is to say, had become forty-eight times as much, and that the number of schools had been more than trebled, the number of young people of 20 years of age, who could neither read nor write, had only diminished in the ratio of 52 to 27, or less than half. This diminution, indeed, appears to become more and more gradual, in spite of the increase of expenditure; and it thus appears that unless other measures than mere increased expenditure and the establishment of new schools are taken, there is no hope of reducing the proportion of perfectly uneducated persons to 10 per cent., in less than fifty years.

"The statistics drawn up by the Minister of War, besides showing the general results to which I have referred, show the great differences between the per-centages of young men of 20 years of age who can neither read nor write, in the various departments of France. No local cause, however, such as the nature of the country, the occupation (whether agricultural or manufacturing) of the people, or their moral condition, can be discovered which explains the immense differences which exist in the proportion of educated persons in the various departments. For instance, the departments of Doubs and Gard, which figure in the first rank, are mountainous and agricultural, covered with forests, &c.; so are the departments of Arriège and Finistère, which stand at the bottom of the list. The department of the Meuse, which occupies the third line, has large valleys where cattle are fed, and it is the same with the Dordogne, which stands No. 81, and with Indre-et-Loire, one of the most fertile parts of France, which stands No. 68. The department of Haut-Rhin, standing No. 9, has as many manufactories as the Nord, which stands No. 56.

"On the other hand, the favourable moral influence of the clergy acts to as great an extent in the departments of La Bretagne and Le Midi, which are the most behindhand in education, as in that of Bas-Rhin, which stands No. 3 on the list. The department of La Seine, with its numerous schools of various kinds, only stands No. 13.

It is true that there are some parishes there where there are five times as many children as the schools can find rooms for. In Paris itself, it appears that whilst in 397,069 workpeople of both sexes, whose state of education has been ascertained, there are only 12 per cent. who can neither read nor write; in certain trades, such as chemical works, there are 74 per cent. of workmen in this state of ignorance, while among the girls employed in the lucifer-match manufacture there was not one who could read or write.

"Among the general causes which, besides the absence of legal obligation, tend to influence unfavourably the state of primary instruction, one of the most injurious in the agricultural districts is the irregularity of school attendance at one season of the year as compared with another. Recent statistics on this point have not been drawn, but it appears that in 1829 and 1833 the ratio was as follows:—

Year.	Winter.	Summer.	Ratio of attendance in summer to that in winter.
1829...	969,340	543,529	0·56
1833...	1,200,715	696,208	0·58

Showing that the attendance in summer was little more than half of that in winter.

"One great cause of this is the carelessness of the parents, the want of attention of the authorities appointed to inspect the schools, and particularly the small interest that the teacher has in the real progress of his pupils under the present arrangements.

"The want of Sunday and evening schools during the winter, where the education of those who had already been taught as children could be continued, and where adults of neglected education might make up for lost time, is another serious evil. Field and factory labour would not interfere with attendance at such schools, and the expense of their organisation would not be heavy, as the teachers in primary schools might be employed in them at a small addition to their salary. Elementary education would thus be improved in its character, and a large number of young workpeople would be rendered fit to attend courses of lectures on technical subjects, which might then be established in the various towns with great benefit to the people.

"As to the very great number of children who work in the factories, the French law of 1831, under which they are allowed to work from the too early age of eight years, for eight hours out of the twenty-four, on condition that they attend some school either belonging to or distinct from the factory, is often evaded, to the great detriment of the physical and moral development of the population, and also of industry itself, as there is often great difficulty in finding intelligent overseers amongst the very ignorant workpeople. There are happily many honourable and numerous exceptions to this unhappy state of things, and the influence of the Industrial Society of Mulhouse, and of several heads of establishments, as well as the example of what is done so successfully in Austria and in Scotland, will lead, we may hope, in a short time, to a radical reform in this respect, and the rule will be adopted of dividing the day for children into equal parts, one of six hours devoted to work, the other to the primary school and to rest, or to the exercises so necessary to children. Up to this time I have only referred to the results obtained with the instruction of boys, because the only statement of the real effects of the actual organisation of primary instruction that we possess, is furnished by the Minister of War, and is obtained by the working of the law, which makes military instruction obligatory.

After passing in review all that has been done for the instruction of women, the speaker said, "That in spite of the continued growth of the budget allowances for primary schools, we must not conclude that on this head our country is more liberal than other countries in Europe. In fact, according to the official accounts of the budgets of the different European states, the proportion of sums devoted to public instruction, and to military services by land and sea, is as nearly as possible as follows:—

States.	Proportional Part of the Budget devoted to	
	Military & Naval Services.	Public Instruction.
France	0·295	0·011
Austria	0 270	0·019
Prussia	0·276	0·014
Bavaria	0 219	0·022
Wurtemberg	0·218	0·047
Saxony	0·214	0·037
Grand Duchy of Baden...	0·182	0·033
Kingdom of Hanover ...	0·128	0·013

"The preceding comparison shows us that France is less liberal with regard to education than many other States, and has not yet either organised elementary instruction, or instruction in technical industry, in nearly so complete a manner as most of the German States, so that we need not be astonished at its inferiority in respect of education which the statistical reports of the Minister of War reveal. If new sacrifices are demanded to complete, in a wise and practical manner, the organisation of primary instruction, in accordance with the law of 1833, everything leads to the belief that they will not be withheld. But, at the same time, we ought to remember that the progress of instruction is far from increasing proportionally to the expenses incurred and to the number of schools, and that, to these augmentations of material means, measures of another kind must be added.

"If our manners, if the national character will not submit to the legal coercion, which is used with so much ease and success in Germany and Switzerland, there may be found other means of obtaining the same result. In considering the elementary instruction which it is right to give children, as a debt due from the father and the citizen, ought we not also to consider the payment of teachers as a special and just contribution, which all the inhabitants who have the means ought to pay? If this principle be allowed, more efficacious measures than those which exist at present ought to be taken. The parent would be then more directly interested in making his child profit by the instruction which he was compelled to pay for, and thus attendance at the school would virtually be rendered obligatory by the imposition of this tax, instead of its being necessary to have recourse, as in Germany, to fines and imprisonment.

"A measure of this character has already been adopted in nearly half the departments of France, and the legal generalization of this measure, until now optional in each locality, would be a great step towards obtaining a more regular attendance at the schools, and thus materially promote the cause of education."

Proceedings of Institutions.

Banbury Science School.—The last report says that at the close of the fourth year a more marked success has been attained than in any former year. Five classes have been in operation during the year, viz.:—Mechanical drawing, conducted by Mr. Pidgeon; animal physiology and zoology, by Mr. Beale; physiological, structural, and economic botany, and systematic botany, by Mr. Beesley. The attendance at all of these classes has been good, and the conduct of the students satisfactory. During the session a close and lengthened inspection of each class was made by J. F. Iselin, Esq., one of Her Majesty's Science School Inspectors, who expressed himself as thoroughly satisfied with the methods of teaching employed. The results of this year's May examination by

the Science and Art Department are as follows:—47 students sat for examination, some in more than one subject. 10 out of this number sat in mechanical drawing, all of whom passed, obtaining 1 bronze medal, 7 prizes, and 3 hon. mentions. 27 sat in animal physiology, of whom 21 passed, obtaining 6 prizes and 9 hon. mentions. 4 sat in vegetable physiology, obtaining 1 bronze medal, 3 prizes, and 1 hon. mention. 11 sat in systematic botany, all of whom passed, obtaining 1 silver and 1 bronze medal, 6 prizes, and 3 hon. mentions. Whereas 70 per cent. of the students who sat for examination in the mechanical drawing class obtained prizes, the average per centage of prizemen on the students sitting in the same subject throughout the remaining schools of the kingdom was barely 23 per cent. Again, in vegetable physiology, 75 per cent. of the Banbury students obtained prizes against an average of 56 per cent. in the remaining schools of the country, while in systematic botany the per centage is as 55 to 34 in favour of the Banbury School. The above calculation takes no account of the medals gained by the students, of which there are 1 silver and 2 bronze offered for competition by the Department in each subject. The Banbury Schools have taken 3 of these bronze medals and 1 silver, the latter being the highest distinction attainable in any one subject. The results given above have not been surpassed, if indeed they have been equalled, by any other school, however successful; such high per centages of prizes have only been approached in one or two of the Irish schools, where the students are of a different and higher class, and the appliances for teaching far more complete. During the last session the Science School has been placed in Union with the Society of Arts, and seven of its students sat in the Examination held by that Society; five of these were successful in obtaining certificates of various grades. At the last annual meeting a resolution was adopted that a local fund should be formed to supply prizes in addition to those furnished by the Department. £7 was contributed for this purpose by members of the Central Committee and other friends of the School; this fund has been appropriated to the purchase of books, which will be given to the most successful of the students. The value of the Science School has received a prompt illustration during the past year. By making a persevering use of the advantages afforded him by the mechanical drawing class, one of its members has succeeded in raising himself from the workman's bench to the far higher position of a professional draughtsman. The prize for Local Herbaria, offered by C. Faulkner, Esq., appears to have elicited a good competition. The conditions of the competition were that the plants should be gathered within eight miles of Banbury, and that they should be deposited with the teacher of the class, before the end of June in the present year,—properly dried, mounted, named, and arranged according to the natural system. In awarding the prize, more value was to be given to rare plants, and especially such as were new to the locality, than to those of common occurrence. Three collections were sent in at the prescribed time. One contained 493 species of flowering plants, and gained 603 marks; another contained 507 species, and gained 585 marks; the third contained 495 species, and gained 590 marks. The prize, after a careful examination, was awarded to Reuben French, he having obtained the highest number of marks, because his collection contained the greatest number of new and rare plants. The other collections were, however, so very meritorious, closely approaching in number of marks, and even exceeding in number of specimens, that which obtained the prize, that the secretary and Mr. Beesley determined to give prizes of less value to these also, as a recognition of the intelligence and industry of their exhibitors. Mr. Cadbury's prize was awarded to Thomas Ward for the greatest number of species and neatness of arrangement; Mr. Beesley's was given to Alfred French.

Fine Arts.

Royal Academy of Brussels.—M. de Keyser, recently appointed director of the Belgian Academy, has just pronounced a rather remarkable inaugural speech. After a few remarks on the characteristic differences of Greek and Roman art and the causes of the decline, which had become most complete about the time of Constantine, and on the long period that the debasement continued, because, according to M. de Keyser, no one, no school, took for basis the only eternal foundation of all art, the study of nature, he arrives at the revival in Italy, and dwells with artistic delight on the labours of the Tuscan school, the works of Cimabue, Giotto, and Masaccio, and the great artists of the next period, Michel Angelo, Raphael, and Leonardo da Vinci. But his chief subject is naturally the Flemish school, of which he says, it came into existence almost at the same time as that of Tuscany, and exhibited, especially at the outset, not only great depth of sentiment, but also great novelty in technical modes of expression. He then referred to the decadence of the Italian school, which had not exhibited any sign of revival for at least two centuries, and added, that though Flemish art had certainly had its periods of poverty, when bad taste, fashionable caprices, political misfortunes, and other circumstances sometimes seemed to threaten it with utter destruction of the traditions, which are its principles of vitality, that it had escaped from such disaster, and still possessed masters devoutly following in the paths of their ancestors of the seventeenth century. M. de Keyser concluded with an energetic protest against the idea of a school departing from its traditions, its original idea, and attempting to graft in its stock the taste and the methods of another and a different one, concluding with a declaration that, in his opinion, mural painting—of which, however, he spoke with the greatest respect—was utterly opposed to the spirit of Flemish art, of which Rubens might be taken as the most splendid embodiment. The artistic world agree almost unanimously with the new director of the Academy at Brussels, when he says, with laudable patriotism, that Belgium has taken a high position in the movement which is now going on, and there is every prospect of her maintaining the spirit of her traditions, and a high place amongst the schools of the present period. The many recent exhibitions which have taken place bear testimony to the foundation which exists for this proud claim and congratulatory anticipation.

Public Monuments.—The people of Nice are about to raise a statue in memory of Massena.—A large and fine medallion of Rossini, modelled by H. Chevalier, is now being cast in bronze, and will be placed in the saloons of the Grand Opera and Théâtre Italien of Paris, if not in other lyrical theatres also.—Kœnigsberg has raised a statue of its famous logician and critic, Emmanuel Kant, who was born in that town in 1724, and never quitted it till his death, in 1804. The inauguration was appointed to take place on the 18th of the present month. The only inscription on the pedestal is the surname of the savant—than which nothing could be in better taste or more effective.—The Academy of San Fernando at Madrid has accepted the plans of M. Médina for a monument to the great painter Murillo, which is to be placed opposite the Museum of Paintings, at the entrance of the Prado.

Architectural Notes.—M. Viollet-le-Duc has just completed a beautiful chapel with crypt, in the style of the commencement of the thirteenth century, on the property of M. Florent-Lefebvre, Maire of Monchy-le-Preux, near Vitry, in the department of the Pas-de-Calais. The stone altar, the coloured glass, the lead and the iron work are of great delicacy. The consecration took place a few days since.—The new building of the Hungarian Academy at Pesth is to be decorated with statues of Leibnitz, Newton, Descartes, Galileo, and Raphael, in terra-cotta.

Manufactures.

Exhibition at Bayonne.—A Franco-Spanish International Exhibition has been held here, which has only recently closed. The building was a temporary structure of wood and canvas, lighted from the top with a lofty portico of the same material, decorated with the arms of France, Paris, Madrid, and the Spanish provinces represented by their products. It was announced to open on the 10th of July, but was not completed for some time after the official inauguration. In the large courtyard, by which the public entered, stood a crucifix of colossal size in blue granite, the production of a quarryman named Henrot. Some well-known Paris houses sent some fine specimens. Among the goldsmiths' work Froment-Meurice exhibited portions of a dinner service made for the Pasha of Egypt, and valued at 600,000f.; a *ciboire*, or Communion cup, from the design, it is said, of a Polish lady, presented by her to the Church of Pau; a rich and exquisitely sculptured chalice; a second one, encrusted with rubies and turquoises; and a tea service for the Empress of the French. Christofle, of Paris, also sent specimens of silver-gilt articles of the same kind; Clesinger and Fremiet their bronzes, and in ironwork groups of statues for fountains, dogs and horses' heads as ornaments for kennels and stables. One gallery was devoted to the Aubusson tapestry of Requillart and Cloquart and porcelain of Bordeaux manufacture. Tissues of various kinds, house furniture, musical instruments of every variety, metals, ores, agricultural products, ploughs of many forms, machinery, cotton from Algeria, minerals, grain, specimens of hard wood from Africa of dark colour and capable of high polish, cedars of Lebanon 400 years old, specimens of Paris pottery, imitations of Italian majolica, &c., filled several galleries. Though the Exhibition professed to be Franco-Spanish, yet Spain did not contribute much in the way of natural products. There were in the agricultural section a few samples of Malaga and Logrono wines, as well as wheat, rye, and maize of Cordova. In an annexe was a flower and fruit show. There was a Department of Fine Arts, but the pictures do not appear to have been generally of the highest class. There were some good portraits, a dance in the court-yard of a posada by M. Fieros, and a picture of the cathedral of Burgos and a chapel of that of Toledo by the same artist. In this department Paris contributed two portraits by Ricard, sketches of scenery in France and the East, by MM. Courbet, Corel, and Brest, and, as a specimen of historical painting, Corneille reading one of his tragedies in the Hôtel Rambouillet. A Neapolitan beggar-boy, by Bonuat, of Bayonne, attracted much attention. Bordeaux and Lyons sent some good landscapes, and among other objects of art were sketches in water-colours by the late Eugene Delacroix. At first the price of admission was over 2 fr., but towards the close it was reduced to 50c., except on one day in the week, when a franc was charged.

Agricultural Machinery in America.—The use of machinery is largely on the increase. The corn is now planted, cultivated, cut, threshed out, taken to market, warehoused, and loaded into vessels by machinery. A boy with a rolling cultivator can do the work of twenty men with the hoe, and do it better. A new binding machine, which uses wire, has been introduced, with the following results as compared with hand labour:—

By Machine.	dols.	By Hand.	dols.
One binder, per day...	2 00	5 binders, 1 day each	10 00
Board	0 50	Board, 1 day each...	2 50
20lbs. wire	5 00		
	7 50		12 50
			7 50
		Profit on machine	5 00

Earl Granville's Iron Works.—Extensive additions are being made to Earl Granville's Ironworks, at Etruria, by the erection of a large number of puddling furnaces and rolling mills. The new works will occupy both banks of the canal, and are close to the Hanley branch railway.

Commerce.

The Petroleum Trade.—The shipments of petroleum from New York during the present year to all parts of the world amounted to 12,943,486 gallons, against 13,491,877 in 1863, being a falling-off of 443,391 gallons. The shipments to Liverpool during the present year were 499,645 gallons, against 1,643,447 in 1863, to London 1,644,099 gallons against 1,646,447, in 1863, to Glasgow 317,388 gallons against 350,079 in 1863, and to Cork 2,129,213 gallons against 1,193,569 in 1863. The shipments from Boston this year were 946,618 gallons against 1,332,779 in 1863, from Philadelphia 4,903,275 gallons against 4,283,646 in 1863, from Baltimore 603,889 gallons against 728,571 in 1863, and from other ports 2,271 gallons against 288,643 in 1863; making the total shipments from the Western Continent in 1864, 19,403,989 gallons against 20,102,316 last year. The importance which this article is taking in France may be judged from the fact, that in the first seven months of the present year the total quantity imported was 9,795 tons (it is counted by weight), and that all, with the exception of the insignificant quantity of three tons, was taken out of bond for consumption. Of the 9,795 tons 1,565 arrived from England, 1862 from Belgium, 8,039 from the United States, the rest from other countries. The estimated value of the whole was in round figures 5,300,000f. (£212,000). The recent modification in the import duties in Italy will, no doubt, lead to the introduction of this oil into that country on an extensive scale also.

Wallachian Petroleum.—A late number of the *Polytechnisches Journal* speaks of a new outlet of earth oil in the rich and remote province or principality of Wallachia. The German journal, after warning commerce to remember that the oil wells of Pennsylvania and Canada have a way of suddenly going out, "thanks, in a great measure, to the indiscriminate way in which rich mother Earth is so bored and tapped, as to make it easy for the gas to escape, by which the petroleum would else be forced up, or else for water to get in and flood or choke up the springs," goes on as follows:—"But there are other petroleums fast coming into the market. Not to speak of the Burmese Rangoon oil, which has long come to England as ballast, and is used in many German refineries, in January of the present year, the first cargo of Wallachian oil reached London. It was of 280 tuns, and the company which brought it have closed a contract to deliver 20,000 tuns in the year 1864. A second "Wallachian Petroleum Company" has since been formed. Two specimens of the Wallachian oil compare as follows with an average quality of Pennsylvania:—

Qualities.	Pennsylvania Oil.	1. Wallach.	2. Wallach.
Colour	Greenish Brown.	Brown.	Dark brown.
Fluidity (water=1)	0·73	0·68	0·09
Specific gravity......	0·813	0·840	0·894
Smell	Moderately strong.	Strong and unpleasant.	Not very strong.

The general result of Dr. Otto Buchner's analysis is, that the Wallachian product is a valuable contribution to commerce and industry, although he does not think it has demonstrated its fitness to compete with the petroleum of Pennsylvania. Dr. Buchner, however, has not found his experiments confirm the assertion of American analysts, that the lighter Pennsylvania oils of a specific gravity of 0·80, gives 90 per cent. of burning oil. His highest result has been 70 per cent., of which from 15 to 20 per cent. was of benzine.

The Adulteration of Cotton in India.—At a recent meeting of the Glasgow Chamber of Commerce, Dr. Forbes Watson spoke on the supply of cotton from India. The cotton trade, he said, was in a very unsatisfactory condition. The cotton grown in India was very much superior there to what it was when seen in this country. When it arrived here it was very dirty, and this arose mainly from the fact that the producer had no interest in producing a good article; he got as much for dirty cotton as he got for clean. Now, unless some measures could be adopted to produce it clean, he did not see much hope for the future; and his impression was that, when the war was over, they (in India) were likely to go back into their old position. The Indian cotton was not gathered dirty, but it suffered from dirt being fraudulently put amongst it while it was being conveyed between Goojerat and Bombay. Portions of the cotton were taken from the bales, and stones, dead animals, or water, substituted. A bill had been passed to grapple with this fraudulent dealing, and he had no doubt this measure would do good; but they required something more. They had got European houses in India purchasing good cotton, and sending it home to this country in their own name. If these houses could grasp the whole cotton trade of India, and the European agents be brought into contact with the producers, then he was in hopes that good would result, but at present this was not practicable. He thought if there were agents in the interior of India who had a knowledge of cotton, and who could point out from examination where the good cotton and bad cotton was produced, it would have a good effect. What they wanted was, something that would produce rapid action; and he was of opinion that this could be best effected by the thorough classification of cotton by skilled classifiers—the pick of the men from brokers' offices here—who would be paid high salaries and be above temptation. If they had a system by which these men would be appointed to classify the different bales, he believed they would bring about all that was required. The merchant would only buy cotton after it had been classified and passed through the press. He believed that a system could be introduced for a thorough sampling of the cotton, and it was for the members of the Chamber to say how it was to be carried out. An association might be formed for the purpose, but probably it would be better for the Government to undertake the work.—Mr. Dunlop said it would be a most desirable thing if the length of the staple could be improved. It was grown on a very small scale, and cotton was the worst paying crop they could raise in that country. That was the reason the high prices had not had the effect it was supposed they would have. They were now giving six or seven times the price, but they had not got either the quantity or the quality; the price had not had the effect of bringing good cotton into the market, but the quantity had improved. It was quite apparent that there had been no improvement in the handling of the cotton in India, while the cotton imported from China was remarkably well cleaned. It was a matter of very great importance that the cotton should be improved, and he thought they were not likely to get it well assorted unless something like what Dr. Forbes Watson had proposed was carried out by the Government. —Mr. Galbraith concurred in the remarks made by Mr. Dunlop; and after a short discussion, the matter was remitted to a committee to consider it and report, and communicate with Dr. Forbes Watson on the subject.

Colonies.

The (Natal) New Public Offices proposed to be erected at Maritzburg are estimated to cost £18,000 altogether, and are plain but substantial in character.

New Zealand.—An atlas has lately been published containing six geological maps of New Zealand, with descriptions, by Drs. Von Hochstetter and Peterman, published at Gotha the end of last year. The first of the series is a general chart of the islands, indicating the localities of gold, copper, chrome, iron, sand, graphite, coal, nephrite (on the west coast of this island), and the active volcanoes, with an enlargement of the Auckland Isthmus. The second takes in the southern part of the province of Auckland, and purports to be a complete chart, showing all the various formations, with enlargements of the Taupo and Lakes district. The third map is that of the Isthmus of Auckland, showing with great clearness the extent of volcanic country and the peculiar volcanic hills which stand like a skin eruption on the level surface. This is the map which Mr. C. Heaphy, of Auckland, is accused of having pirated from Dr. Von Hochstetter's copy in his charge and sent to the Geographical Society as his own. The fourth map comprises the districts of Aotea and Kawhia, on the west coast of the same island. The fifth is a map of Rotomahana, the hot springs and the adjoining district. And the last is the province of Nelson. Though all the descriptive part of these maps is in German, they will be found to convey abundant information to the student of any country, inasmuch as science, which is of no nation or tongue, has here set her marks in unmistakeable colours. Dr. Von Hochstetter is ready to allow both this and other evidences of the work to be open to any one approaching them with an enquiring spirit.

Coal and Water Supply at Nelson.—Two bills have been prepared by the Nelson Government for this purpose. The object of the coal bill is to authorise the Superintendent to raise a loan of £50,000 for the purpose of opening and working the mines in the province. This loan it is proposed to raise by debentures of £100, bearing 8 per cent. interest, payable half-yearly out of the revenue of the province. A sinking fund of £2 per cent. per annum is provided for the liquidation of the debt, such sinking fund to be invested in such manner as the government shall direct. The bill contains another clause not bearing specially on the coal loan, but still of importance to that loan, as showing that the government desire to see their small existing liabilities wiped off, and this will afford further security for the new loan should such be deemed necessary. The total debt of the Province of Nelson, after deducting the share falling to be borne by the now distinct Province of Marlboro', is £21,500. To liquidate this debt a sinking fund of 10 per cent. is now proposed. The loan of £20,000 for water works is proposed to be raised on the same terms as the coal loan, by £100 debentures, bearing 8 per cent. interest, for which and for the principal (which is payable in 30 years) the revenue of the province is to be pledged. There is a marked difference between the two loans. The coal loan is decidedly for an object of provincial importance embracing all interests, commercial and agricultural, rural and urban. The water works is purely local, and affects beneficially only a limited number of the city inhabitants, while, should the bill pass, many will be subjected to a heavy rate for water from which they gain no advantage whatever.

Railways in Natal.—A colonial paper says the nominal capital of the Natal Central Railway Company is subscribed. It proposes to construct a line of railway suited to general traffic from Durban to Maritzburg; this line is to be carried round by the Isipingo and between the Umlaas and Illovo Rivers to the capital of the colony, a distance of about 70 miles. But the precise line of route must not be viewed as finally fixed, and should any shorter and more direct route than that at present surveyed be pointed out, the Company will gladly adopt it. In the Bill submitted by the Company distinct provision is made for an alternative line for the last fifteen miles of the distance to be traversed, that is, for the portion nearest Maritzburg. A line 50 or 60 miles long would be worked at much less annual cost than a line 20 miles longer, and

which passes through country that would for some time to come present few inducements in the shape of intermediate traffic warranting a deviation. Upon this line a government guarantee is asked by the Company of 6 per cent. on the capital expended. That capital is nominally fixed at £600,000, but presuming the line should be 70 miles in length it might be £50,000 more. This guarantee, then, may be looked upon as essential in one shape or other to the construction of railways in Natal. And in return for this concession the government must also exact several necessary conditions. Power of supervision is maintained over the working and regulation of the line; thus a check is placed upon extravagance, needless expenditure is curtailed, and the Company is compelled to work the line at the minimum cost. But this is not all. One very important feature of the system, and one that has been almost wholly overlooked, is that the sums paid by a colony towards the guarantee are not lost for ever. They come back to the exchequer. Whenever the line pays more than the guaranteed per-centage, the Government steps in and shares these profits. This may be confirmed by citing the case of India; there, up to the 31st of December, 1861, the Government had paid altogether on account of guarantee £6,286,895; but it also had received back and had to place against that £1,250,000 sterling. This, too, was at a time when few of the lines constructed were completed—when few of them were yet in a position to make returns. There are, of course, other concessions given in addition to a money guarantee, such as grants of land or mining rights. These are what the coal company ask, and it seems probable that an Overberg Railway would be cheaply obtained at a sacrifice, say of 600,000 acres, of waste land, and of a mining monopoly for twenty years over a certain area of country. Unless there are rapid means of transport, and a stimulated stream of immigration, the land must remain waste, and the mines must be undeveloped for years to come.

Obituary.

The Duke of Newcastle died on Tuesday evening, the 18th inst., after a protracted and severe illness, at Clumber Park, Notts. Henry Pelham Fiennes-Pelham-Clinton, K.G., fifth Duke of Newcastle-under-Lyne, Staffordshire, twelfth Earl of Lincoln, Privy Councillor in England and also in Ireland, one of the Council of the Duchy of Lancaster, Lord Warden of the Stannaries, and Lord Lieutenant and Custos Rotulorum of Nottinghamshire, was the eldest of the six sons of Henry, fourth duke, by his wife Georgina Elizabeth, daughter of the late Edward Miller Mundy, Esq., M.P., of Shipley Hall, Derbyshire. He was born in Charles-street, Berkeley-square, on the 22nd of May, 1811, and was educated at Eton, and Christ Church, Oxford, where he took the usual B.A. degree in 1832. He was returned to Parliament at the general election of December, 1832, as one of the members for the Southern Division of Nottinghamshire. He entered the Lower House of Parliament as a Conservative. He voted against the ballot, the removal of Jewish disabilities, the admission of Dissenters to the universities, the revision of the pension list, and the limitation of Parliament to a three years' duration, and supported the corn laws and the Church Establishment in Ireland. He married, in 1832, Lady Susan Harriet Catherine Hamilton-Douglas, only daughter of the late Duke of Hamilton and Brandon. He had five children by this union—a daughter, Lady Susan Charlotte, now the widow of Lord Adolphus Vane Tempest, and four sons, of whom the eldest, Henry Pelham Alexander, Earl of Lincoln, was born in 1834, and married in 1861 Henrietta Adela, daughter and heir of the late Henry Thomas Hope, Esq. On the formation of the first Peel Ministry, the late Duke, then Earl of Lincoln, held office as one of the Lords of the Treasury; and when, after Sir Robert Peel had been six years out of office, that Minister returned to place in September, 1841, the first Commisionership of Woods and Forests was given to Lord Lincoln. This he relinquished in January, 1846, on accompanying the Lord Lieutenant to Ireland, as Chief Secretary, a post which he resigned when his party retired from office in the following month of July. The Earl of Lincoln, owing to the gradual change in favour of Liberal opinions, which came upon him, felt obliged, in February, 1846, to vacate his seat for South Nottinghamshire. Some months afterwards, however, a vacancy occurred in the representation of the Falkirk Burghs, for which he was returned; and this constituency he represented until his removal from the Lower to the Upper House of Parliament, in January, 1851, as Duke of Newcastle. In December, 1852, he accepted the post of Secretary of State for the Colonies, which he exchanged, in June, 1854, for the then newly-created post of Secretary of State for the War Department. In that capacity he had to bear much of the odium attaching to the Aberdeen Cabinet because the army, and especially the commissariat, was mismanaged during the early part of the Russian War, and he therefore retired from the post on the House of Commons assenting to Mr. Roebuck's motion for a parliamentary committee to inquire into the state of the British army before Sebastopol. He did not again take office until 1859, when he returned to his former post at the Colonial Office, which he finally resigned some months since on the ground of failing health. When the Prince of Wales paid a visit to Canada, the Duke of Newcastle was selected to be the companion of his tour. His Grace was elected a member of the Society of Arts in 1853.

Publications Issued.

The French Academy of Inscriptions and Belles-Lettres, &c. (*L'Ancienne Académie des Inscriptions et Belles-Lettres*), by M. Alfred Maury.—This is a curious history of the early periods of the academy by a very competent writer. Established in order to remodel the whole system of history, the academy certainly commenced its operations in a very modest manner; it composed the devices for the medals struck in the time of Louis XIV., and for the monuments erected in honour of the Grand Monarch. Its first attentions were bestowed on numismatics and lapidary work. Somewhat later the King employed the new academy to choose designs for the tapestry of the royal palaces, and to compose the programmes of the fêtes and ceremonies at Versailles. In time, however, its sphere of operation became wider and more worthy; the academy took up the study of ancient coins and the subject of mythology; but in the eighteenth century the difficulties which surrounded those subjects were enormous. The church opposed these inquiries, and historic dogmas stood in the way at every step. It was in 1735, that Ellie Blanchard scandalised his colleagues by reading a paper on "Magical Exorcisms;" they called out, in terror:—"You are walking on flames covered over with a deceitful crust of ashes!" Lévesque de Pouilly was denounced as atheist and libertine for daring, before the era of Niebuhr, Beaufort, and Arnold, to doubt the facts of the early histories of Rome. Not to believe in Romulus and Remus was, at that time, treason and blasphemy. Fréret was absolutely flung into the Bastille by one of his own associates in the academy for having proved that the ancient Francs served in the armies of Cæsar. At length, however, the academy discovered the right path and succeeded in following it; archæology became an admitted and even a popular study. Ancient inscriptions were deciphered, and the history of old monuments thus evolved; the oriental languages were taken up and the field of philology thus

widely extended; and Sanscrit was found, or supposed to have been found, to be the matrix, the typical form of the whole family. The learned author has grouped the main facts of the biography of the academy, during two centuries, together with great skill, in a single volume, which will doubtless be highly popular with the greatly increasing class of archæologists and antiquarians. Some of the early entries are amusing enough. For instance, Nicholas Henrion, one of the early members of the academy, invented a system by which he could calculate the exact bodily stature of the patriarchs and demi-gods; the result of the application of this standard was to prove that Adam was 123 feet 9 inches high, Eve 118 feet 9¾ inches, Noah only nine feet less, Abraham not more than 27 or 28 feet high, Moses 13 feet, and Hercules 10 feet. We may well say, if we credit M. Henrion, that there were giants in those days, and we have since been growing "small by degrees, if not beautifully less." M. Maury either has brought out, or is about to publish, a similar volume containing the chronicles of another academy, that of the sciences.

Amongst other works just published in Paris are the following:—

L'Histoire de la Sagesse et du Gout, from the earliest time of Greek civilization to that of Socrates, by A. Morel, 8vo.

La Philosophie Individualiste, a study of the works of Humboldt, by Challemel-Lacour, 18mo.

Les Oublies, a life of Bernard Palissy, by Louis Andiot, 12mo.

M. Leneveux, a gentleman of philanthropic views, commenced some five years since the publication of a series of small books at 60 centimes each, under the generic title of the *Bibliothèque Utile*, and has devoted himself to the object with great energy, in spite of all kinds of difficulties and discouragements. The projector has, however, obtained the aid of several eminent writers, well known as friends of the cause of popular education. The whole of the works published are original, and amount at present to thirty-six volumes, M. Leneveux's intention being to carry it to a hundred. The scientific portion includes "Astronomy," by Professor Catalan; "An Introduction to the Study of the Physical Sciences," by Professor J. Morand; "History of the Earth," by Léon Brothier; "Elements of Health," by Dr. Louis Cruveilhier; and other works on chemistry, pneumatics, mechanics, and medicine.

Notes.

Great Central Cattle Market and Abattoir for Paris.—The extension of the limits of the City of Paris has disarranged the old arrangements for the slaughtering of cattle, which is not allowed except just at the outskirts, and most of the old abattoirs have been pulled down, and others rebuilt beyond the fortifications. This is, however, but a temporary measure, as, before long, there is to be but one great abattoir for the whole of Paris. This establishment will also be in connection with one great cattle market, which is to replace those of Poissy, Sceaux, and La Chapelle. The joint establishments will be at La Villette, close to the canal of that name, and to the circular railway, which will shortly be completed, when it will form a means of junction between all the lines of railway having termini at Paris, as it already does to three or more. The underground works of the great abattoir are already completed, with their system of drains terminating in the canal above mentioned. The buildings themselves are also raised some yards above the ground; they include 407 scalding-houses for 1,200 butchers, with vast pens for cattle and sheep. All the calves sent to be killed are to be examined by competent inspectors, and those promising to make good cows are to be set apart for sale, to be purchased in fact by the establishment for re-sale to private individuals. The market is to be erected by a company, which will, for a certain number of years, receive a toll on all the cattle sent to market. It is expected that this new establishment will effect a great economy in the article of butcher's meat, as at present the animals have to be sent for sale to Poissy, Sceaux, or La Chapelle, thence to the various slaughter-houses around the city, and afterwards to the butchers, whereas, when the new market and abattoir are completed, the graziers will send direct to it, and there will remain only the carriage of the meat to the butchers within the city. There is an importation into France of cattle from Germany, Hungary, Servia, and the Danubian provinces, and the cost of conveying a bullock from Vienna to Paris is no less than 62 francs (£2 10s.); the reduction of the expenses in the case of French breeders and feeders is expected to have a very beneficial effect on the home trade.

The International Exhibition at Oporto.—A crystal palace was commenced at Oporto in 1861, the first stone being laid by the devoted King Pedro V., and is now nearly finished. It is proposed to hold an international exhibition therein, and Don Fernando, the father of the King, has been placed at the head of the commission for carrying out this intention. It is said that the Exhibition is to open in June next, but this will scarcely afford time for sufficient notice.

Oyster Exhibition.—Doctor Anatol Gillet de Grenniont is engaged in giving a series of lectures on maritime culture at the Jardin d'Acclimatation in the Bois de Boulogne, Paris, and one of the lectures being on ostreiculture, an invitation was addressed to the proprietors of the great oyster beds of Regneville, the Isle of Tridy, Concarneau, La Rochelle, the Isle of Ré, Marennes, Arcachon, and other places, to send each not less than twelve dozen of oysters for public exhibition on the occasion. A report is to be made thereon and published in the journals.

Cooking without Fire.—M. Babinet, of the French Institute, has laid before the Academy the result of his experiments in this direction. His recipe is:—Place your food in a black pot, cover it with a pane of glass, and stand it in the sun. The water soon boils, and the food is said to be of better flavour than if cooked in the ordinary way.

Medicinal Plants.—Mitcham produces annually from 30,000 to 40,000 bushels of roses, and about 11 tons of chamomile flowers. Lavender yields from 10 lbs. to 20 lbs. of oil per acre. Four hundred of chamomile flowers are about the yield per acre, giving from 8 to 10 lbs. of oil. Penny royal gives about 12 lbs. per acre.

Correspondence.

DWELLINGS FOR THE LABOURING CLASSES.

Sir,—I request you to record in the *Journal of the Society of Arts*, for future reference, the accompanying observations of Mr. Gladstone on the working of the Factory Acts, which he delivered recently at Bolton, at the opening of the Farnworth Park, the gift of Mr. Barnes to the town. They are useful in their bearing on adult education, which the Society promotes, but are especially so in reference to the dwellings of the poor, which I trust it will become the work of the Society to ameliorate. What Mr. Gladstone says of the factory system before the law intervened, "that, partly owing to the state of the law, and partly owing to human infirmity and negligence, much was discovered that called for amendment," may be applied in the same words to the labourers' dwellings. The manufacturers were "first of all placed under jealous and microscopic examination, and much criticism was the result. But those employers of labour have now become in many instances, the standard-bearers of enlightened

improvement as regards their relations to their workmen." Let the law subject the dwellings of the poor, and the owners of those dwellings, to "jealous and microscopic examination" of impartial public authorities as a beginning, public opinion will itself, without further measures, effect much reformation; and when the voluntary reformation stops short, then let the law step in and hasten it. It is the duty of the commonwealth to declare that its labours and expenditure to promote the health, the education, and the moral improvement of its people shall not be neutralised by human selfishness and neglect, or any theoretic pedantry for prejudices which have been assumed to be principles of political economy. In a broad point of view, putting aside smaller differences, the duties placed on manufacturers might be imposed on landlords, and what landlords ought to do, but could not be made to do by law, unions could do. Manufacturers once protested against the factory laws as interference with the sacred principle of *laissez faire*, but they have now become the "standard-bearers of enlightened improvement." Let analogous measures be taken with landlords, beginning with those represented by corporations of all kinds, including especially colleges. Although the cost may fall, in the first instance, upon them, as on the manufacturers, the community at last will pay it. The numerous allusions to the dwellings of the labouring poor which have been made during the recess, by leading public men of all parties, prove that the Society of Arts has wisely taken up one of the most pressing questions of the day.

I am, &c., HENRY COLE.

15th October, 1864.

The following are the remarks of Mr. Gladstone:—

The presentation by Mr. Barnes is happily not an isolated act. It is part of a great system, part of a great movement. He is, indeed, the representative, and the honoured representative, of a principle and a tendency which is among the very best characteristics of the age. In this busy, stirring, critical, industrious, enterprising, money-making, money-accumulating age it is well that while these pursuits have full scope given it should not be forgotten that there are other wants and other interests; and, in particular, I call Mr. Barnes on this occasion the representative of a deep and growing conviction with respect to the relation that ought to prevail, and that happily now to a very great extent does prevail, between the employer of labour and the labouring population of the land. I think, ladies and gentlemen, that it is about 30 years since a gentleman of high character and of great ability, employed in the public service in Ireland, created very considerable alarm and apprehension by putting forth in a concise and telling form what was thought the somewhat revolutionary doctrine that "property has its duties as well as its rights." The doctrine was received by many for the moment as revolutionary—as if it were some monstrous conception aiming at the breaking up of society; but that dreaded monster, if such it was, has now become a domesticated idea. It has entered with us into every house, and it lies as quietly by our firesides as if it were the favourite dog or cat of the family. Property has its duties as well as its rights, and the relation of the man who employs labour to the man who gives labour never can be permanently satisfactory or secure if the exercise and practical form of that relation are confined to the mere settling of the cash account of the wages of the man. It is doing violence to the principles of human nature, it is running up a score against ourselves, it is offending against the will and designs of Divine Providence, if we refuse to recognize the fact that moral associations and social and endearing ties of affection belong to, and ought never to be severed from, the relation between the master and the workman. Well, now, circumstances brought about a result which at first did not appear to be satisfactory to the manufacturing districts of this country, but which I believe was a matter calling for the deepest thankfulness. I mean this: the relation of employer and labourer had never been in this country thoroughly and carefully examined until it came to be examined in the case of the factory system. When it was examined into much was brought to light that was highly unsatisfactory. There can be no doubt at all, as a matter of fact, that, partly owing to the state of the law and partly owing to human infirmity and negligence, much was discovered which called for amendment. It does not follow that the state of the factory system even at that time was in any respect worse than the state of the general relations between the employers and the givers of labour throughout the country; but you were first of all placed under jealous and microscopic examination. Much criticism was the result; bugbears were sent abroad through the country. The idea began to be entertained in many quarters that the factory population was a debased population, and that those who employed them were a set of tyrants or misers; and, moreover, it was believed that there was something hopelessly incurable in the nature of the system, and you will well recollect that the ignominious appellation of white slavery was by many persons in the country applied to it. I don't know that it was a very pleasant process for Lancashire to undergo that examination, but, after all, Lancashire has come better out of it than might have been expected. For what has since taken place?—the laws have been amended, and with the amendment of the law there has come—what? No amendment of the law can of itself secure a wiser, a kinder, a more philanthropic, a more enlightened spirit on the part of the employers of labour, a more orderly habit, a higher intelligence, a stronger confidence, a more affectionate system on the part of those by whom labour is given. It is not too much to say, though I doubt not much may remain to be done, it is not too much to say that something like a moral transformation has passed over the district in which I speak, and in no part of England more than here, in the circumstances of the last few years. I say the manner in which suffering has been met,—that surest test of what constitutes the true man,—has settled the question of the estimation in which the factory population are to be held by the rest of their fellow-countrymen. Now let me turn more closely to the subject that has brought us together to-day. Those employers of labour—I mean the masters of factories—who were first of all placed under critical and jealous examination, have now become in many instances, in instances daily increasing, the standard-bearers of enlightened improvement as regards their relations to their workmen. It is impossible to overstate the importance of this fact. Nothing can be more clearly proved by a long experience than the nature of that commercial power, energy, and enterprize which Providence has imparted to the British nation, be it for good or be it for evil. But I hold it is for good. The people of this country have already become, and are in all likelihood destined yet more extensively to become, workers for the world at large. At this moment, if we are truly informed by the best authorities, of every two loaves of bread that are consumed in this country one is the product of a foreign soil; and perhaps we might venture to say, not with precise accuracy—but for the sake of establishing the parallel I am giving the substantial truth—we might venture to assert that for every two yards of cotton consumed throughout the globe one yard is of British manufacture; if that be so, we must look to the factory system as a system destined for a still further extension, and we might ask ourselves whether we are prepared or mean to recognize it as a legitimate,—nay, I will venture now to say an honourable and distinguished portion—of the economical and social arrangements of the country. Now, ladies and gentlemen, it is not easy, and I am sure you will agree with the sentiment, to make the acquaintance of perhaps 30,000 people in the course of a couple of hours; and yet, with a certain allowance and indulgence to the necessities of public speaking, I might almost venture to say that I have made acquaintance, through

the medium of the demeanour and through the countenances, with the population in the course of this morning of certainly not far short of the number that I have mentioned. No man could see the faces of that population without being aware that, in point at any rate of general intelligence, he had no reason to suppose that they were likely to be in any respect unworthy of the noble British nation to which they belong. Well, but there used to be an idea that loyalty and the factory system did not go well together. I should like to know what has become of that idea. When Her Majesty, in days brighter for her than now, traversed the streets of Manchester, was it possible that anything could exceed the manifestation of loyalty and love that she received from the highest to the lowest of the population? Words themselves would fail me if I were to attempt before you to describe the affectionate attachment which prevaded this entire community as between the people and the occupier of the Throne. Well, but intelligence is a great thing, and loyalty is a great thing, but there are other things which constitute the happiness and well-being of the community at large. Now, there has been in former times an impression abroad that the effect of the factory system was to weaken or dissolve the sacred ties of the family; that it introduced disobedience to nestle like a serpent in the very hearth of the family; that the relations of the young child and the parent and the parent and the child were vitiated and destroyed by the premature independence of your youthful labourers. Now that is a fair description not, thank God, of the state of things, but of the impression which once prevailed with regard to the state of things. Well, now, I think it may be said that, with respect also to this great and vital question, the experience of the last few years has not failed to throw upon it a flood of light. I think it has completely exploded the idea that less attachment is felt by the parent for the child, or less attachment felt by the children for their parents, in the heart of the manufacturing districts than in any other portion of the community. I should humbly presume to say, having had some opportunity of forming a judgment, that I have been astonished to see the strength, the warmth, the unconquerable tenacity of domestic affection among the people of Lancashire employed in manufactories. All these are points upon which I may say that the factory system may very well afford to stand or fall, but I cannot help thinking that there are many things connected with it that may be taken as an example by other classes; take the spirit of order and discipline which pervades our factories, not the mere restraint which is imposed on the labourer while he is within the walls of the factory itself, on the contrary, it is the formation of a habit, and if you ask why it is that tens of thousands and hundreds of thousands can be simply self-governed and self-arranged without outrage, without difficulty, without disorder, without the appearance in almost a single instance of the authority even of the police, it is in a great degree on account of that habit of order and discipline which is to be found within the walls of those establishments. But take a point of still greater importance. If we are to judge rightly the operation of that system, it has this effect, it brings the people together, and they acquire an interest in one another, a public opinion, so to speak, forms itself among them, and that public opinion is favourable to morality and good conduct, and the person who goes astray is felt to have committed an offence against the character of those with whom he or she may be associated in working; but it is not possible to conceive a principle more truthful or more valuable for the real advancement and improvement of the working classes than that that opinion should thus spontaneously, naturally, and healthfully be engendered among them, according to which the order of working men and working women may become, as it were, an effectual minister of virtue, and vice and mischief will be discouraged in their first beginning. I will now turn to another matter, with regard to which the factory system may not, perhaps, stand so well. It may be said, with truth, that in-door occupation has not a very favourable operation on the physical development of the people. We must speak our minds in an assembly of Englishmen such as this, and it was at one time too true of the factory system that, from defective ventilation and other causes, it was anything but wholesome as regards the bodily health of the population. Now, the bodily health of the people is a matter of vital consequence. When God Almighty made man to be a composite being of body and soul, he intended the welfare of the two to go together, and you could not have in operation a system which should give you a stunted and enfeebled people without finding before very long that the evil effects of that system were likewise leaving their mark on its mental character; but here, also, I trust we may say that a vast improvement has been effected. There is no reason—at least, so I am given to understand, and confidently hope—there is no reason in the nature of things why factory labour should be less favourable to health, when due care is taken, than other in-door labour. I am now at a point when I think we can see the benefit of the munificent endowment which Mr. Barnes has presented to the community of Farnworth. In-door labour is not of necessity unhealthy, but yet it cannot be denied that it requires the counterpoise of out-door recreation. It is desirable that those who spend the great bulk of their time indoors, whether in factories, in tool-shops, or in any of the other great establishments of industry, should have the means, when their labour is done, of innocent, healthful, and useful recreation. It is monstrous to suppose that it can be the natural condition of society that one portion should live as if they had nothing at all to do except to seek for amusement from morning to night, and that the other portion of society should find itself shut out from recreation altogether. Such a state of things can neither be pleasing to God nor beneficial and acceptable in the sight of man, nor can it conduce to the prosperity of the country and the stability of its institutions. Here is the great fact, recognised by such acts as we are endeavouring to carry out and to place in commemoration to day. Here we have before us a scene in which, as we hope, from generation to generation, the young and old of Farnworth will seek for health and refreshment after the hours of honest labour have come to a close; but it is not only bodily health which is interested in this question, mental health demands that communion with nature should not be forsaken and renounced. This is one of the truths which it has been the obligation and necessity, but likewise the honour and duty, of the present generation to bring forth from darkness into light. I dare say it is a fact that we do not even yet feel that as we ought to do, or give it that effectual application in practice which it requires; but it is profoundly associated with the well-being of mankind. Communion with nature: why, the phrase, if used perhaps so recently as a century ago, would have sounded almost like the accents of an unknown tongue. At any rate, it would have been taken as the mere dream of a visionary enthusiast if it had been supposed that it was a thing to be recommended for the health, recreation, and habitual enjoyment of a vast population. Within that time, however, great changes have taken place. In order to illustrate this point, which is one of deep interest and importance, I may go a little further. It has been long a subject of discussion among learned men whether the ancients, who, as you know, in point of genius reached the very greatest heights of which human nature appears to be susceptible—it has long been a question whether these ancients had any love for nature or natural scenery—which we call landscape. That subject is still keenly discussed; and I do not believe any one can assert that a taste for the beauties of nature, such as we now understand them, was largely developed among the most cultivated nations of antiquity. Departing, however, from the question of natural beauty, there can be no doubt that the communion with nature which takes the form of

natural history—knowledge of plants, trees, and so on—was a thing never dreamed of as forming a part of the patrimony of mankind at large. Some philosopher, giving scope to his penetrating and searching mind, might attempt to register what human knowledge had accumulated on this subject; but one would be laughed at if one were to suppose that it were possible for a Roman or Greek to find pleasure and satisfaction in the familiar communion with nature through the medium of humble and individual objects. Again, it was debated how it came about that in beautiful countries the population did not care for the scenery, and Lord Macaulay, in his "History of England," goes into an argument as to why the beauties of the Highlands of Scotland were so long neglected.

The Lord Mayor's Dinners.—Sir,—*The Times* recently announced that a City Committee had been appointed to superintend the coming feast of the Lord Mayor's induction to office. I would like to suggest to this committee the idea that these corporation dinners require a reform, and are really very bad, and not creditable to the wealth of the city, and do not gratify the majority of the visitors who eat them. A fine illuminated *menu* is placed before each guest, but it is notorious that, after serving the turtle soup, it is a mere scramble to get anything else named on the *carte*. I once had to dine off green peas only, although tempted with a long list of all sorts of things, which it was impossible to obtain, yet nothing could I get but peas, whilst I appealed in vain to every waiter who came within reach. The way in which public dinners are given at the *Hotel de Ville*, at Paris, offers some useful suggestions to any valiant reformer in the City. On one occasion when I dined with six hundred people at the *Hotel de Ville*, every guest obtained a first-rate dinner, of excellent quality and variety, and admirably served. And the method of it was this: a complete dinner of soups, fish, *entrées*, *pièces de resistance*, game, &c., was provided for eight persons; the dishes were admirably contrasted with each other; the wines were appropriate to each course; I counted that my glass was changed sixteen times! there were four waiters to every eight persons, who attended to them and no others. This dinner for eight was perfect, and the secret of giving every other person of the company the same advantages simply consisted in repeating the same perfect dinner as many times over as there were parties of eight to be provided for. I advise the City Committee for the next Lord Mayor's day to follow this example. Let them provide for a party of eight persons, the two turtle and another (say white) soups; the turbot and another fish; two *entrées;* the venison and roast beef; the sweets and the ices. Let them avoid the riot and uncertainty of a hundred other dishes named in a *menu*, and stick to these, and then multiply the fixed dishes by the parties of eight invited. Instead of placing before every one a bottle of burning sherry and handing round only disturbing champagne, let them select a glass of appropriate wine to go with each dish, and offer it to the guest following each dish. Let them insist that each set of waiters attend only to their own party of eight, and not wander off to distant Common Councilmen with the prime cuts of turbot and venison. By following this simple method they may inaugurate an epoch of reform in civic dinners which is extremely needed.*—I am, &c., Felix Summerly.

* This suggestion appears so very practical, that it is hoped it may be adopted at any future anniversary dinner of the Society.—Ed. *J. S. A.*

The Squares of London.—Sir,—We have introduced gardening with great effect into our public parks; why cannot it be introduced into some, at least, of our squares. Why should not some of them be thrown open, and laid out with flower-beds, and paths for the people to walk through instead of round. Take Leicester-square, for example; throw down the rails, lay it out as a garden, and keep it well tended and watered. I have lately been to Paris; and while all around was hot and dusty, the small "Places," with their brilliant verdure and bright flowers, were a charming relief to the eye. There can be no real reason why we cannot have such things here. I simply throw out the idea, in the hope that it may be taken up by some practical inhabitant.—I am, &c., P.

Patents.

From Commissioners of Patents Journal, October 14th.

Grants of Provisional Protection.

Axle boxes—2328—J. Clark.
Blast furnaces, &c., applying to useful purposes the slag of—2360—J. A. Harrison.
Clocks, means of actuating electric—2362—W. Clark.
Doors, garden gates, &c., latches for—2174—F. Weaver.
Dyeing and tanning—2336—M. Henry.
Engine governors—2384—J. and W. Weems.
Fibrous materials, rollers and wheels for drawing—2386—H. A. O. Mackenzie.
Fibrous substances, bleaching—2326—H. Potter.
Files, machinery for cutting—2355—P. A. L. de Fontainemoreau.
Fire-arms—2330—G. Lister.
Fire-arms, breech-loading—2322—J. H. Walsh.
Fire-arms, breech-loading—2371—J. P. Harriss.
Floor cloth, manufacture of—2340—J. H. Kidd and J. C. Mather.
Fluid meters—2364—H. Bennison.
Fuel, apparatus for generating gas for—2237—Z. S. Durfee.
Furniture, article of—2368—W. H. Orth.
Gas fittings, chandeliers, &c., representing the glass parts of, on show cards, &c.—2352—J. T. Stroud.
Hair brushing apparatus—2356—E. Ostler.
Hooped skirts—2370—R. A. Brooman.
Life boats—2346—D. Climie.
Liquids, machinery for raising—2348—R. A. Brooman.
Looms—2380—W. Whitehead.
Metal, shears for cutting—2372—I. Parkes.
Minerals, apparatus for working—2293—T. Taylorson.
Ovens for baking, apparatus used in—2379—T. Powell.
Photography, obtaining surfaces in "relievo" and "intaglio" by the aid of—2338—W. B. Woodbury.
Pumps—2374—J. C. Wilson.
Railway crossings—2344—H. Bridgewater.
Railway trains, communication between passengers and guard—2388—C. W. Allen.
Sails, reefing, furling, &c.—2358—J. Fergus.
Salt cake, manufacture of—2316—G. Scott, jun., and J. Tudor.
Sewing machines—2366—H. C. Symons.
Ships, apparatus for steering—2376—H. and H. Forbes.
Ships, &c., protecting the sides and bottoms of—2332—W. Larcom.
Throstle spinning, &c., apparatus for effecting the drag in—2382—A. Pemberton and J. Ford.
Vehicles, disconnecting lever to release—2321—J. R. Hofmann.
Vehicles, registering apparatus applied to—2148—W. Clark.

Patents Sealed.

948. W. Ovenden, sen., and W. Ovenden, jun.
955. J. C. Coombe.
956. H. B. Barlow.
960. A. Priest and W. Woolnough, jun.
961. W. Payton.
962. W. E. Gedge.
963. M. B. Cooper.
964. J. Riley.
971. W. E. Gedge.
974. G. Davies.
976. J. E. Spratt.
982. W. G. Cooper & J. Fletcher.
994. J. Standeven.
996. H. Wadkin.
999. H. A. Bonneville.
1000. H. A. Bonneville.
1001. H. A. Bonneville.
1011. T. Pepper.
1012. G. Davies.
1016. W. L. Barnes.
1052. E. Taylor.
1068. C. H. Pearson.
1072. T. G. Ghislin.
1500. J. G. Jones.
1686. J. H. Johnson.
1932. A. L. Wood.
1994. C. Lowe.
2084. A. Ford.

From Commissioners of Patents Journal, October 18th.

Patents on which the Stamp Duty of £50 has been Paid.

2542. T. B. Collingwood and A. Butterworth.
2558. W. Macnab.
2609. R. Mushet.
2637. R. Mushet.
2646. C. Brison & A. Chavanne.
2565. C. Wynants.
2571. J. Dixon and R. Clayton.
2583. W. T. Weston.
3124. W. Bell.
2601. P. Robertson.

Patents on which the Stamp Duty of £100 has been Paid.

2633. G. Rhodes.
2614. C. C. Alger.
2630. T. Restell.
2628. F. H. Holmes.
2652. L. Arbel.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110TH SESSION.] FRIDAY, OCTOBER 28, 1864. [No. 623. VOL. XII.

TABLE OF CONTENTS.

Announcements by the Council.

The One Hundred and Eleventh Session of the Society will commence on Wednesday, the 16th of November, when the Opening Address will be delivered by Wm. Hawes, Esq., F.G.S., Chairman of the Council.

DEMOLITION OF THE INTERNATIONAL EXHIBITION BUILDING.

Tuesday afternoon, at half-past three o'clock, the demolition by gunpowder of the remaining portions of the Great Exhibition Building was proceeded with by the Corps of Royal Engineers from Chatham. There were present on the occasion General Sir J. Burgoyne, Colonel Lovell, Colonel Scott, Captain Fowke, Lieutenant Knocker, and a party of the Sappers and Miners under Colour-Sergeant Cann, Professor Donaldson, Sir Stuart Donaldson, and a large number of scientific gentlemen, together with a considerable crowd of sightseers both within and without the ruins of the structure. The engineering operations had been completed during the day for the purpose of displacing one of the two towers that supported the great dome. The height of each tower averaged 70 feet by 42 feet square, the weight being 1,200 tons, the thickness of the walls being an average of from three to four feet, the superficial area of the towers being about 40 feet square. In order to dislodge this mass of masonry the amount of charge applied was proportioned in the amount of 112 lbs. of gunpowder to each tower; and, in accordance with this arrangement, precisely at half-past three the signal to fire the battery at some fifty yards distance from the structure to be demolished was given (the range in front of the road having been cleared by a strong force of the L division), when suddenly, with scarcely any audible report, one half, but one half only, of the tower rolled over with a loud crash into the Exhibition-road, leaving the other half of the tower standing intact. In the course of an hour the debris was removed from the road. It was then determined that no further operations should take place in connection with the removal of the other half of the tower. A consultation took place amongst the engineers with Sir J. Burgoyne, and it was determined that the engineers should "shove" it over by leverage, or by a further additional charge the next morning.

Proceedings of Institutions.

HARTLEY INSTITUTION.—In presenting to the Town Council of Southampton their first Annual Report of the progress of the Institution since its organisation in the year 1863, the Hartley Council express the satisfaction with which they look back upon the history of the Institution. They cannot, in giving an account of their stewardship, point to the achievement of any brilliant triumphs, but they unhesitatingly assert that although the progress which the Institution has made may have not been surprising, it has at least been continuous, that its development has kept pace with the opportunities which have offered for the extension of its usefulness, and that it has realised, so far as time has as yet allowed, all the expectations which a rational regard for the conditions in which it is placed, and the machinery at its disposal, could have formed of it. It is, indeed, one of the disadvantages under which the Institution has laboured that at its origin ideas were formed and expectations encouraged by some persons as to the work which it was to do, which, if realised at all, can only be so after the lapse of a considerable time, and by the aid of much greater resources than it at present possesses. Apart from the direct educational influence which it has exercised, it has, indirectly, been the means of fostering the exertions of other Institutions. Thus it has provided accommodation within its walls for the meetings of the Polytechnic, Athenæum, and Microscopic Societies; and it has greatly promoted the establishment of a society* which is calculated not only to contribute an important share towards the advancement of knowledge in this locality, but also to further materially the interests of the Institution itself. By these and other means the Hartley Institution is gradually coming to be looked on as the recognised centre of all associations. If the Institution had been of no further service during this the first year of its organization, than to gather all these associations together within its walls, the Council would have, on these grounds

* The South of England Literary and Philosophical Society which meets in the Institution.

alone, reasonable cause for congratulation. But they have a still more tangible source of satisfaction in the large number of persons who have availed themselves of the advantages of the Institution. The number of members enrolled during the year has been 531, of whom seven are life members, 19 are honorary life members, 131 are family members, and 374 are ordinary members, but this statement by itself gives a very imperfect idea of the number of persons who have frequented the Institution during that period. Putting aside all reference to the large numbers who have visited the Museum on public days, and to the casual attendance upon lectures, the ticket of each ordinary member carries with it a duplicate admission to the privileges of the Institution for one of the members of his family; in addition to which, he himself has the power of admitting friends to the museum, library, and reading-room, so that the real number of persons frequenting the Institution is considerably greater than the mere list of members would indicate. The Hartley Council, therefore, feel justified in asserting that the Institution, during the short period that it has been already established, has exercised an unquestionable, though, perhaps, in many respects, a silent influence on the mental culture of the town and neighbourhood. However desirable it may have appeared that it should assume the position and functions of an educational establishment, the Hartley Council are convinced that in the present stage of its career such a course would involve requirements with which it is totally unable to comply. Even were the machinery available for such a purpose, much more extensive than it really is, it is very questionable whether the Institution could enter on such a path as has been adopted by the Mechanics' Institutes of some of our larger towns without interfering seriously with the objects which are specified in the scheme laid down for its management by the Court of Chancery. Under these circumstances, and as all movement in this direction must be of a tentative character, the Hartley Council have confined their efforts for the establishment of classes to those branches of knowledge for instruction in which the Institution possesses adequate appliances, or to those in which the experiment could be made without incurring any serious detriment in case of failure. The growing importance of natural science as an element of general education, and the absence in the town of any recognised means of instruction in it, seemed to offer a favourable opportunity for opening a class in the most popular branch of scientific study—chemistry. A French class has also been established. Although the attendance on these classes has not been so large as could have been wished, the Council hope that as they become more widely known they will be better appreciated. When the subject of the appropriation of the Hartley bequest was under consideration, the attention of the Town Council was urgently drawn by Dr. Lyon Playfair and others to the desirability of including instruction in navigation amongst the objects for which it might be made available. The utility of such a school is beyond question, and it is hardly possible to see how it could be more favourably started than in connexion with the Hartley Institution, especially if a teacher be appointed possessing the certificate of the department of Science and Art, in which case, with the aid of a moderate fee from the students, there is every reason to believe that the school would be almost if not entirely self-supporting. The Hartley Council, therefore, recommend that steps should be at once taken to commence a school of navigation in connexion with the Institution, and request power accordingly to take such steps. The Hartley Council have received an application from the committee of the School of Art requesting that the school might be transferred to the Institution. Although the Council consider that the union of the school with the Institution might have its advantages, perhaps more prominently by the facility it would afford to the furtherance of the establishment of the navigation department before alluded to, they regret that the accommodation of the Institution at present is not such as to meet all the requirements of the School of Art. It may be a consideration hereafter to erect a separate building on the unoccupied land behind the lecture hall of the Institution, and the Council will at the proper time bring the subject more fully before the Corporation. The library contains at the present time upwards of 5,000 volumes of works in all departments of knowledge, the majority of them being of a standard character. The expenses connected with the furnishing and completion of the building have been so great this year that the Council have been compelled to devote a much smaller sum to the augmentation of the library than they could have wished, but they trust that as claims of the former kind diminish they will be gradually enabled to do fuller justice to so important a department of the Institution. The reading-room attracts a considerable number of visitors during the day, but the Council regret that it is not so largely frequented in the evening as they could wish, more especially by that class of the community who might have been expected to avail themselves of its resources at that time, viz., clerks, trade assistants, and others engaged during the day. This is the more surprising as it was with a special view to the interests of this class that the hour for closing the reading-room was prolonged from 9 till 10 p.m., and that the terms of admission to the Institution were made so low as to be little more than nominal. The Council trust that employers will impress upon their assistants the important advantages which the Institution holds out to them, and will exercise their influence in inducing them to join it. The Council have received several suggestions on the subject of introducing newspapers into the reading-room, but have not hitherto felt at liberty to recommend the adoption of such a course to the Town Council. The Hartley Council have every reason to report satisfactorily of the progress which the Museum has made since the opening of the Institution, especially when it is remembered that with scarcely an exception the whole of the specimens have been received as voluntary contributions, the necessary demands upon the income of the Institution rendering it impossible for the Council to take advantage of several opportunities which have occurred for the purchase of partial, or complete collections, and which under more favourable circumstances they would have been glad to embrace. Although it must be the work of many years to place the Museum on a footing worthy of the Institution and of the town, the Council feel no hesitation in asserting that it already offers much that is both interesting and instructive; and they would more particularly instance the nucleus of an economical collection which it contains as one which, when more complete, will be calculated to be of great value in promoting the education of the public in a knowledge of those "familiar things," but which have been hitherto too much neglected as a branch of popular instruction. The large number of persons who visit the Museum on public days is a good indication of the interest which it awakens, and the Council hope that as their resources increase they will be able to make it still more useful as a means of education. They need only further observe that the present arrangement of the contents of the Museum is necessarily only of a temporary character, and that the labelling of the specimens is proceeding as rapidly as circumstances will permit. The donations, both to the Museum and library, have been very numerous. The following lectures have been delivered in connection with the Institution during the past year; for those marked with an asterisk the Council are indebted to the gratuitous assistance of the gentlemen by whom they were kindly given:—"The Solar Spectrum," by Dr. Bond; "The unity of plan of the Vertebrate division of the Animal Kingdom," by Mr. Waterhouse Hawkins; "The relation of the Vegetable Kingdom to the natural wants of Man," by Dr. Lankester, F.R.S.; "The Life and Writings of Oliver Goldsmith," by the Rev. J. M. Bellew; *"The Weapons of the Modern Artillerist," by Captain Drayson, R.A.;

"Life and Light," by Mr. R. Hunt, F.R.S.; "Some illustrations of special adaptation in the Animal Kingdom," by Mr. Gosse, F.R.S.; "Scientific Researches in the higher regions of the Atmosphere," by Mr. Glashier, F.R.S.; "The Nature and Origin of Coal," by Dr. Bond (two lectures); "The Metamorphosis of the lowest tribes of Animals," by Dr. Carpenter, F.R.S.; *" The Age of Bronze," by Mr. J. Lubbock, F.R.S.; "The Gases," by Mr. J. Pepper; "Coal in its relation to Modern Civilization," by Dr. Bond (two lectures); "The Life and Writings of Milton," by the Rev. J. M. Bellew. A course of three lectures was also given during the month of June by Dr. Bond, in illustration of some of the contents of the Museum. The attendance upon the above lectures was, on the whole, good and encouraging. Although the Hartley Council are prepared to acknowledge that isolated lectures ou literary and scientific subjects have a certain value in an educational point of view, there can be no question that in most cases they give so imperfect an idea of their subject as to be of but very limited utility for educational purposes. With the view of obviating as far as is possible this defect the Hartley Council propose to provide short courses of three or four lectures each, after the example of the Royal Institution and others of a similar character. The Council report that the experiment of the first of a series of concerts in illustration of the music of the great masters, which was given in May last, and devoted to the music of Mozart, was in every respect a satisfactory one. They hope to repeat these concerts on a more extended scale. The balance-sheet of the income and expenditure of the Institution is submitted, showing an annual income of £1,243, of which £865 19s. 10d. is derived from permanent sources, and an expenditure which leaves a balance of surplus in the treasurer's hands of £6 5s. 4d. The Hartley Council, in compliance with one of the clauses of the scheme for the management of the Institution, which specifies that a sum of not less that £50 shall be yearly set apart towards the establishment of an observatory and the formation of a botanic garden, have set apart the sum of £100 for the above purposes, being £50 for each of the two years that the Institution has been open.

HITCHIN MECHANICS' INSTITUTION AND PUBLIC LIBRARY.—The annual meeting of the above Institution was held at the Town-hall on Friday evening, the 17th of October, 1864, Mr. John Morgan, vice-president, in the chair. The report stated that, during the past year, the library had been more used than in any previous season. The entries this year amounted to 6,286, showing an increase of 305 over last year, and 90 over any former year, and a gradual increase from the year 1859. The subscriptions had increased, and by a careful expenditure, the income had proved rather more than sufficient to defray all charges, notwithstanding a loss on the lecture account. Seven lectures were delivered during the winter session, but the attendance has gradually diminished. The low charge made for admission of members and their families was established with the object of inducing larger numbers to attend the lectures, but the committee regret that, in consequence of the small attendance this year, the receipts have fallen short of the expenditure. The committee trust that the course of lectures for the coming season will meet with general approval. At the last Examination of the Society of Arts, held in May, two members obtained Certificates of Merit—one for proficiency in Geography, the other for Free-hand Drawing. The sub-committee appointed to consider what steps could be taken to carry out the project of a Union of Institutions in this neighbourhood, report that they do not find it practicable to form such a Union at the present time. The sub-committee have entered into communication with the neighbouring Institutes. The replies received have been either unfavourable or doubtful. Until classes are in existence, and in active work, for carrying on which the need of co-operation is felt by the Institutes, the project does not appear likely to receive support.

Fine Arts.

ROUEN EXHIBITION, MUSEUMS, IMPROVEMENTS, &C.—The capital of Normandy has always been one of the most interesting places in France, but, during the last six or seven years, it has become as remarkable for its encouragement of art as for its antiquities. In 1833, or thereabouts, the authorities and amateurs of the neighbourhood seem to have determined not only to protect and illustrate the artistic remains of past centuries, but to render Rouen the local centre of modern art. In the year 1834 a society was formed, with the title of *La Société de Amis des Arts*, "to aid the progress of art in Rouen, and to encourage artists by the purchase of works from the exhibitions organised by the municipal administration." The condition of membership is the payment of thirty francs on the occasion of each exhibition, and subscribers pay ten francs each, the pictures purchased being distributed by lottery amongst both classes, every ten francs carrying the right to a chance. For some years the exhibitions were annual, but at present they take place every second year, and, since the establishment of the society, it has purchased and distributed nearly a thousand pictures, at a cost of upwards of 180,000 francs. The progress of the Society is best indicated by the fact that in 1849 the Society was able to expend 6,594 francs on 45 works of art, and in 1862 it laid out 21,520 francs, and distributed 60 pictures amongst its members. The exhibitions are held in the Hotel de Ville, and the municipality votes a sum of money to cover the expenses, and another in aid of the funds of the Society, or for the purchase of works of art for its own public gallery. The amounts of the two votes this year were, respectively, 6,000 and 2,000 francs. The exhibition, in order not to clash with others of the same class elsewhere, opened on the first of the present month, and is to remain open till the middle of November; the price of admission for five days in the week is by tickets, which cost 25 centimes, or less than 2½d., and each of these gives the right of participating, *pro rata*, in a secondary lottery arranged by the authorities. Finally, there are two entirely free days towards the end of the exhibition The number of works of art in the Exhibition now open is 819, and many of those are by well-known artists, amongst whom may be mentioned André, Bellangé, Court, Flandrin (Paul), Flers, Glaize, Grobon, Grosclaude, Gudin, Guiand, Hamon, Hillemacher, Holfeld, Jacquand, Lefebvre, Leleux, Magand, Pasini, Phillippoteaux, Schnetz, Vauchelet, and Yvon. A large proportion of the pictures were sent by artists resident in Paris, and in going through the Exhibition last week we recognised many works which attracted attention at the Paris Exhibition, but the resident artists of Rouen and other parts of Normandy have supplied a fair share, and it should not be forgotten that of those who have taken up their abode in Paris, a great many are natives of Normandy. M. J. Court, the present director of the public gallery of Rouen, the painter of a large well-known picture now to be seen in the Exhibition Boissy-d'Anglas, presiding over the National Convention, and formerly one of the most popular portrait painters in Paris, is a native of Rouen; so are Eugène Bellangé and many other well-known artists. The present Exhibition is arranged in the public gallery of the town, and, as was formerly the case with the Paris exhibitions when held in the Louvre, the temporary collection covers the permanent one. The latter dates back as far as 1809, and the works have been mostly obtained within the department itself; the Imperial government has, however, contributed many works of art purchased at the Paris Exhibitions for distribution among provincial museums, and only the other day some remarkable pictures and busts were received from the Department of Fine arts in Paris; the municipal authorities have also voted several sums to purchase addi-

tions, and many donations have enriched the collection, which includes some remarkable works. Amongst others may be mentioned "The Virgin Surrounded by Angels," known as the "Vierge de Saint-Sixte," by Raphael, and small but fine works by the same hand, and in that master's best style. The "Virgin in the midst of a group of Young Girls," by Van Eyck. The "Conversion of Saint-Matthew," by Valentin. "Saint François," by Anabale Carracci. A "Ecce-Homo," by Miguard, and pictures by Jouvenet, Vernet, Lahire, Le Guerchin, Lemonier, and other masters, besides some good pieces of sculpture, ancient and modern, the whole forming a very worthy collection. In the year 1833 also was founded the *Musée departmental d'Antiquités*, which was opened to the public in the following year. Rouen offered several buildings well suited for such a purpose, amongst others one of the churches suppressed in 1791—*Saint-Pierre du-Chatel*, an edifice of the 15th century, the tower of which is entire and of great beauty, now occupied by a shot factory—but the cost of putting such a building in thorough repair placed it out of the question. No one building could, however, have been better adapted for the purpose, namely, the ancient convent of *Sainte-Marie*, a cloistered building, forming a quadrangle with a garden enclosed. The entrance is by a gothic porch, in one corner, which, like two sides of the quadrangle, is vaulted, and seems exactly designed to secure a collection of specimens of ancient art; and here is already a museum which in some respects may vie with the Hotel Cluny in Paris. The glory of the place, the first objects that meet the eye, are the exquisite stained glass windows brought from the Church of Saint Elor, now a protestant chapel, and other dismantled edifices in the town; they are in admirable condition, and for design and colour have few rivals, and their size being just suitable for the old windows of the convent they are seen to perfection. These beautiful windows illustrate the progress of the art from the 13th to the 17th century, to an extent which does not exist in any other museum in the world. The specimens of ecclesiastical sculpture in stone and wood, terra-cotta works, church furniture and utensils, are numerous, and some of them of rare beauty, especially the enamelled works of the early Christian period, in the semi-Byzantine style. There is also a large collection of flints illustrating the age of stone; of bronze implements and arms; of armour of the middle ages and renaissance; of pottery, glass, and metal works of the Gallic and gallo-Roman periods, found principally in the excavations at Lilleborne; a mass of objects of middle age and renaissance art; a good collection of coins; a few fine Limoges enamels; and some specimens of mosaic, including one Roman pavement fourteen feet square found at Brotorme. Among the archæological curiosities are several charters of the 10th, 11th, and 12th centuries, one signed by William the Conqueror and his son Rufus (with crosses, merely, of course), and bearing date 1038; others of Henry I. and Richard I., all in excellent condition; the oldest, however, is one of Richard II., Duke of Normandy, of the 10th century, but without date. There is a small glass box containing what remains of the heart of Richard Cœur de Lion, found, together with a monumental effigy of that monarch, in the Cathedral of Rouen not long since; some curious early watches; the double-bladed sword-stick with which the Minister Roland committed suicide after his wife's execution; and two swords used by Talma on the stage. The larger specimens of sculpture and other objects are placed in the garden, or built in appropriate positions into the walls of the old conventual building, which is a mass of beautiful arches, sculptured key-stones, bas-reliefs, and mural tablets and ornaments; and side by side with these and with ancient fonts in stone and lead, is a heap of stone balls, one of very large size, with which Henry V. and others pounded the walls of Rouen during the many sieges which it has sustained. The brothers Corneille were natives of Rouen, and the houses in which they were born were only demolished a short time ago, and the door of that in which Pierre was born is now to be seen in the museum forming the entrance to one of the cloisters. The museum is growing at a rapid rate, and will doubtless become one of the best in France, out of Paris; it is not yet catalogued, hence the importance of the details here given, but most of the articles are carefully labelled. A few weeks since a very interesting feature was added to it—and which was one of the principal inducements of our visit to the town—namely, a fine collection of the old *Faïences*, earthenware of Rouen and other places, made by M. Pottier, the conservator of the museum, and purchased of him by the local authorities. The collection is arranged in five principal groups, with four subsidiary series of illustrations, in one line of presses, admirably arranged and perfectly lighted. The first great compartment contains specimens of the original ware and its first artistic development, the oldest piece being a water bottle inscribed with the place and date of manufacture—"Faict à Rouen, 1647." This is the earliest known epoch of the art in this locality, derived from Nevers, and introduced by one Jehan Custode, belonging to a family of old potters of that place. The principal makers known are Edme Poterat, Sieur of Saint-Etienne, who obtained a patent, or concession, for the manufacture in 1644, and his son Louis, who obtained a similar grant from the Crown in 1673, and who made porcelain as well as faïences. The specimens of this early period are of a milky white, with designs in blue, in the Indo-Chinese style in use at Nevers; but Louis Poterat studied in Holland, and afterwards introduced imitations of the ware of that country and, indirectly, of Japan. The second large case and two small ones exhibit the manufacture at its most brilliant period, namely, towards the end of the seventeenth century, when the Minister Colbert did all in his power to encourage the Rouen manufacture, and brought the ware under the notice of the king. The events of the time aided this in an extraordinary manner. The condition of the finances was so bad that Louis XIV. was forced to descend from gold to silver plate, and the courtiers from silver to earthenware. Saint Simon, in his memoirs, says:—"Many were compelled to send their plate to the Mint and to adopt faïence"; necessity, on the one hand, became the mother of improvement on the other, and the poverty of the Court was the fortune of the Rouen potters. The beauty of the ware of this period is certainly remarkable; the ground is even in colour and texture, the forms are simple and regular, and the ornamentation is varied, original, and admirably executed; the blue became slightly mixed with red, and in some cases yellow and green were introduced—a handsome salad bowl, signed Brument, 1699, being a fine specimen of golden colour. The ornaments were all done by hand, and consequently each piece exhibits a certain amount of originality. The boldness and delicacy of the work favours the opinion that the outlines were traced by artists and the filling in by the hands of women. The employment of females in this manufacture is proved, to a certain extent, by a passage in the will of Edme Poterat, who died in 1687, leaving all his property to his wife, Marie Lequien, which says that all or nearly all he possessed had been earned by her care, she having had the entire direction and management of his manufacture of faïence, and of all the utensils appertaining thereto during his lifetime. The number of specimens of the best epoch amount to more than a hundred, and include a number of very large round dishes of perfect shape; many of the plates bear the arms of noble families for which they were made, while others are fancifully decorated with the words and music of popular airs. One jug, signed "Anno Domini, 1708, 28e Juillet," is remarkable as one of the few specimens of the period in which the human figure is treated with much success; the design is that of Venus or Ariadne sleeping beneath a starry sky, and surrounded with foliage, flowers, birds, and insects in

varied colours. There is also a fair collection of other articles, such as writing desks, inkstands, pierced sugar castors, salt cellars, tripods, cornucopias and vases. There are some curious copies of Chinese designs; and seven pieces ornamented in niello or black arabesque, on a chamois coloured ground of great beauty and variety. The examples of the third division commence with the eighteenth century, and exhibit undoubted indications of the decline of the art more especially with respect to decoration; the forms also are less pure and the applications more fantastic, but including several historic pieces, such as a service with the arms of the Duc de Montmorency-Luxembourg, governor of Normandy. The fourth section of the exhibition shows the absolute decay of the art—tortuous forms, uncertain drawing, and glaring colours, in short *rococo* of the worst kind, relieved, however, here and there, by fine bold pieces of ware, worthy of the former periods. By 1780, or thereabouts, almost all trace of artistic feeling had disappeared, and the Rouen manufacturers, who had enjoyed a high reputation for a century and a half, gave themselves up to the production of the commonest crockery. After that period the manufacture almost ceased entirely, and the present exhibition derives additional interest from the fact that great and successful endeavours are now being made to revive it in Rouen and other places. The gem of the exhibition, or at least of the curiosities included therein, is a celebrated violin of the ordinary size, which was in the collection Sauvageot, and which furnished M. Champfleury with the theme of a poem. This piece is of a late period, but its ornamentation is admirably executed, but resembling the productions of the Dutch makers rather than of the French. The principal design represents a lady playing a spinette, a gentleman with a violin, and three or more other figures in the costumes of the time of Louis XIV., while a group of angels in the clouds exhibit musical instruments and books, and one of them holds a scroll with the following inscription:—"Musica et gloria in Aer." The other parts of this curious piece are ornamented with great taste and skill. Since the above was written we have an account of the discovery in a sand pit, in the village of Ozon, near Châtelherault, of another musical instrument in faïence—a kind of ophicleide. It is also covered with paintings, which are said to be highly artistic. In the interior are three letters, A R O, others being illegible, and it is supposed they formed the word *Pezaro*, and that the specimen discovered is of the famous Majolica ware which ornamented the palaces of Tuscany in the fifteenth and sixteenth centuries. This curious example is to be placed in the museum at Poitiers. The fifth division consists of specimens of ware from other parts of France and from abroad, but this is too incomplete to call for any special remark. The demolition and changes that have been and still are being made in the town, deserve special notice, but it must be deferred to another opportunity.

Fine Art in Paris.—The pupils of the *Ecole des Beaux Arts* who obtained the prizes for Rome the other day, six in number, were entertained at dinner at Saint 'Cloud by the Emperor on Sunday last, together with the Minister of the Imperial Household and of the Beaux Arts, and the chiefs of all the departments and public establishments connected with that ministry—Comte de Nieuwerkerke, Comte Baciocchi; Messieurs Courmont, Camille Doucet, Auber, Robert Fleury, and Schnetz. In the evening the Empress presented each of the young artists with a photographic group of the Emperor, herself, and son, signing each copy with her own hand. Acts like these are both graceful and politic, and tend to maintain the artist in the high social position he holds in France.—The municipal authorities of Paris have voted the sum of 66,000 francs for the repair of the stained glass windows of the various churches in the city. The restorations are to commence with Saint-Germain-l'Auxerrois, Saint-Eustache, Saint-Gervais, Saint-Severin, Saint-Merry, Saint-Sulpice, Saint-Etienne-du-Mont, Saint-Nicolas-du-Chardonnet, and Notres-Dame-des-Blancs-Manteaux; a long list, but far from complete.

Manufactures.

The Factory Act in the Potteries.—An impression appears to prevail in some parts of the Potteries that the limitation of the hours of work imposed by the Factories Act Extension Act does not take effect until the 26th of January next—that being the time when children of twelve will work full time. In theory, the Act has been in operation since the 26th of August last, although, owing to the absence of the official abstracts, it has not been made effective. Copies of the abstracts, however, are now being supplied to the manufacturers throughout the district, so that it will be no longer safe to disregard the provisions of the Act. S. W. May, Esq., has been appointed sub-inspector for the pottery district.

Hardening Cast Iron.—A patent has been taken out for a new method of hardening the surface of castings. When the piece is filed up, or otherwise finished, it is brought to a cherry red heat, and then immersed till quite cold in a solution composed of 1,080 grammes of sulphuric acid, and 65 grammes of nitric acid to 10 litres of water. It is added that the thickness of the stratum hardened is sufficient for all ordinary purposes, and that the iron suffers no distortion.

Alcohol from Coal Gas.—Berthelot, in his new work, comprising the whole of his lectures on Organic Synthesis, delivered at the College of France during the present year, has demolished the proposition for making alcohol from coal gas, showing that the process is extremely costly and the resulting spirit extremely impure.

Pattern Post.—The Postmaster-General has issued an order that on the 1st November next, and thenceforward, patterns of merchandise may be transported by post between England and Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland, by packet, at the following rates of postage, which must be prepaid by means of postage stamps, viz.: For a packet not exceeding 4 ozs., 3d.; above 4 ozs., 6d; above ½ lb., 1s.; above 1 lb., 1s. 6d.; above 1½ lb., 2s.; every additional ½ lb., 6d. Special attention is directed to the following rules and regulations, which will be strictly enforced: 1st. No packet of patterns must exceed two feet in length, breadth, or depth; exceeding such dimensions, it will be treated and charged as a letter. 2nd. The patterns must not be of intrinsic value. This rule excludes all articles of a saleable nature, and, indeed, whatever may have a value of its own, apart from its mere use as a pattern; and the quantity of any material, sent ostensibly as a pattern, must not be so great that it can fairly be considered as having, on this ground, an intrinsic value. Packets containing patterns of intrinsic value will be treated and charged as letters. 3rd. There must be no writing or printing other than the address of the sender, a trade mark and numbers, and the prices of the articles; otherwise the packet will be treated as a letter. 4th. The patterns must be sent in covers open at the ends, so as to be easy of examination. Samples, however, of seeds, drugs, and so forth, which cannot be sent in open covers, may be enclosed in bags of linen or other material, tied at the neck; bags so closed that they cannot be readily opened, even although they be transparent, must not be used for this purpose. Non-compliance with this rule will also subject the packet to be treated as a letter. In all other respects the regulations of the colonial book post will apply to the pattern post with the above colonies. Under these regulations, in order to prevent any interruption to the regular transmission of letters, a packet of patterns may, when it is necessary, be kept back for twenty-four hours beyond the time when, in the ordinary

course, it would be forwarded. N.B.—The rule which forbids the transmission through the post of any article likely to injure the contents of the mail bags or the person of any officer of the Post-office is, of course, applicable to the pattern post; and a packet containing anything of the kind will be stopped and not sent to its destination. Another order, to the same effect, states that on the 1st November next, and thenceforward, patterns of merchandise may be transmitted by post between England and the Republic of Hayti, by packet, at the above rates of postage, which must in all cases be prepaid by means of postage stamps.

Sewage Manure.—Baron Liebig, in a letter lately addressed to Lord Robert Montagu, says—"The natural laws which govern the permanent fertility of soils and the increase of their produce are, from circumstances which I cannot detail here, very little understood by the British farmers; and hence arises a fear that the use of sewage, which ought to be a lasting benefit to agriculture, may be regarded, after a few years, as a veritable detriment by the same farmer who, in the first years of its application, would assuredly give it his approbation. In what may be termed its natural state it is not a universal manure, like stable dung, which is efficacious at all times and on all localities, but a special manure, the continual application of which exclusively tends to impoverish the land. If clearly understood and properly managed, the employment of sewage will prove a blessing to agriculture; and those who, by unwearied perseverance, have at last seen the consummation of their labours, may justly be looked upon as the benefactors of their fellow-men. But loud would be the outcry should the agriculturist, either by his own ignorance or the want of forethought in others, find himself misled. Our name would then become a byeword, and instead of gratitude be recollected with a curse. There are two things which must be done —first, it must be made intelligible to all that sewage in its natural state does not replace stable dung in its entire efficacy, and that, if used exclusively, it will produce abundant crops *only for a time;* secondly, that in each crop the composition of sewage ought to be corrected, according to the nature of the soil, by adding those ingredients which are wanting in sewage, and which the plants to be grown require in the largest proportion. The composition of sewage being once perfectly known, a receipt for what is to be added could be made out and put in the hands of every farmer who uses it; and it remains a question whether it is not possible for the company itself to add those ingredients wanting in the sewage according to the demand of the crop to be grown."

Commerce.

Aberdeen Strawberry Trade.—During the present season, from Aberdeen, the quantity sent southward chiefly to London, to be manufactured into preserves, amounted to about thirty-five tons. This is independent of considerable quantities used at home for the manufacture of "preserves" on the wholesale principle, and for ordinary domestic use, &c., which must have brought up the total quantity to something like 50 tons. A ton of strawberries is worth from £25 to £30. This important branch of market-gardening promises to extend. It is only a few years since strawberries began to be exported southward at all, but the demand is beyond the supply.

Rags.—Messrs. W. Greame and Co. remark that the downward tendency in prices of paper rags still continues, and where sales of low descriptions have been forced, prices have shown a decline of nearly 30 per cent. from those ruling in June last, leaving a heavy loss to importers, and in low qualities of Syrian, Greek, Turkey, and Bombay cottons the decline is even greater, while the finer qualities above 20s. in value have not given way more than 10 per cent. This extraordinary reduction, which even paper makers did not anticipate three months ago, has arisen from several causes, the chief of which is the large importation of low qualities which have been forced on the market. The prices of paper rags for the last five years have not been lower than at present: the average of Egyptian cottons may be taken as a guide, and the auction prices are found to be realized as follows, viz:—

		White.		Blue.		Coloured.	
		s.	d.	s.	d.	s.	d.
1860	January	16	6	13	0	11	6
	June............	15	0	11	9	11	3
	November ...	14	0	11	6	10	9
1861	October	15	3	11	6	10	9
1862	February	13	3	10	9	8	9
	May	12	3	10	3	9	6
	June............	12	0	10	0	9	3
	October	15	0	12	6	11	3
1863	January	15	9	14	3	12	3
	February	16	0	13	9	12	9
	April	15	6	12	0	12	0
	June............	16	6	14	0	12	0
	November ...	16	6	13	0	12	0
1864	June............	16	6	14	0	12	6
	July............	14	3	12	0	11	0
	October.........	12	0	10	0	9	0

Woollens have also shared in the general depression of trade, and at the public sales on the 6th of October the prices realized show an average decline of about 10 per cent. on previous auction rates July 29th; the decline is most marked in the lower qualities, for which there is little demand. Should any orders be received for grey blankets from America, these low classes will improve. The chief feature to notice in woollens is the import of French rags (four or five shipments having been made as a trial), and taking into consideration the depressed state of the Yorkshire markets caused by the Leeds Banking Company and other failures, prices realized are considered satisfactory.

Petroleum.—The exports from New York from January 1 to September 20 amounted to 15,637,366 gallons, against 14,597,246 gallons the same period of 1863. The following is the quantity exported from other ports from January 1 to September 17:—

	1864. Gallons.		1863. Gallons.
Boston	1,110,644	......	1,377,631
Philadelphia............	5,145,767	......	4,395,895
Baltimore	647,844	......	729,792
Portland	5,336	......	288,567
Total.........	6,909,591		6,791,855
Total export from United States	22,546,957	......	21,389,131
Same time 1862		......	6,242,912

India Rubber.—In the last ten years there has been exported from Para 1,059,952 arrobas of fine rubber, and 378,792 lbs. of ordinary. The Brazilian arroba is rather more than 32 lbs., and hence the total shipments have been upwards of 20,600 tons. Formerly the principal shipments were to the United States, now the principal exports are to the United Kingdom. Last year 65,649 cwts. were received in Great Britain from all quarters. The tree which yields the mithy sap in South America is found in great abundance on the banks of the Amazon and most of its explored tributaries. Previous to 1840 it was exported in but small quantities, and chiefly in the form of shoes. After that period, new applications of the article having been made in England and the United States, the export of shoes was soon discontinued, but shipments in bulk largely increased; which increase, with some alterations owing to circumstances affecting consuming markets, has since been progressive. Stimulated to spasmodic exertions by profits which equal in a day the wages of a month given to ordinary work, the half-

civilized labouring population of the province, neglecting the culture of the soil and those industrial pursuits by which they might be permanently benefited, flock to the marshy districts in which the rubber tree is found. There passing many months of the year, with slight shelter and slighter clothing, with no sanitary regulations and no precautions against the malaria which pervades the banks of the Amazon and its tributaries—ravaged by intermittent fevers, and spending in nightly orgies the money so recklessly acquired, their numbers are fearfully diminished, and the population demoralized, with no benefit to themselves and no permanent advantage to the state, which is poorly compensated by a heavy export tax for the sacrifice of its prospective prosperity. As the rubber tree is found principally upon the public domain, upon which the right to labour without restriction or system is free to all, it is not likely that these evil influences will speedily be diminished. The tree is but little injured by the extraction of the sap. It is found in abundance on the islands at the mouth of the Amazon, and on the banks of that river and its affluents in the Province of Para—the Xingu, Topasoz, Amasoz, Gary, and Tocontins. Beyond the limits of the province, higher up the river, even to the borders of Peru, as new tributaries are explored, a more abundant growth is found, and there seems no immediate limit to the preparation of the india rubber, except the scarcity of hands for its collection and the unhealthiness of the districts in which it is procured. India rubber is found in great abundance in the forests along the whole of the sea coast of Ecuador, and there is much enthusiasm for the extraction of this elastic gum, which is already an important article of export. From the port of Guayaquil 2,227 cwts. were shipped in 1863.

The Canals of France are assuming an important development. Notwithstanding that the total tonnage of the barges passing on the canals has increased from 1,246 million tons in 1860 to 1,495 million tons in 1862, or an increase of one-fifth, the Government is urging the construction of additional canals, even in opposition to the railroads.

Teneriffe Cochineal.—Cochineal is the principal article of export possessed by the landowners of the Canaries, and constitutes the chief wealth of the islands. It was first exported in the year 1831, and has gone on progressing until it now reaches 1½ to 2¼ million pounds annually. There are, however, material annual fluctuations, caused by either great heat or very heavy rains, both of which causes destroy many of the insects. It is calculated that a fanegade of land (about 1 acre 16 perches) destined for the cultivation of cochineal, if sufficiently watered, will produce in the following year at least 250 lbs. of cochineal grain ready for sale. This quantity, at the price of 3s. 2d. per lb., will realize £39 11s. 8d. Deducting one-fifth in order to cover the cost of planting, pressing, &c., the net profit of the cultivation will amount to £31 15s. From Guatemala the export of cochineal ranges from 600 to 750 tons per annum, according to the character of the season.

Colonies.

Natal.—Flax culture is one of the branches of industry to which midland farmers look with much hope. About two years ago Mr. Colin Hunter arrived here, with the view of establishing the cultivation of this product in Natal. Since that time he has introduced large quantities of seed, and erected very complete and costly machinery. This seed was distributed among about forty farmers, all of whom planted it. The result, though not generally successful, has not in any way shaken the confidence of the farmers in the ultimate success of the enterprise. Several accidental causes militated against the plant. The seed was not acclimatised. The proper season for sowing was not known. Unusually severe weather interfered with the young crops, and a particular sort of caterpillar proved very destructive. The first of these drawbacks will soon be remedied; the second can only be obviated by experience which is now gained, and the last two will disappear when larger local knowledge teaches the farmer the right time of the year to plant in. It was stated in evidence before a committee of the Legislative Council that the farmers remain confident about the future, and attribute the failure of the crop to the foregoing incidental causes. As a proof of this they are determined to try again,—encouraged by the results attained in those cases where the crop has been fortunate enough to mature. The Council has, therefore, recommended that the seed now in Mr. Hunter's possession, and which is of a superior and more suitable description, be purchased by the government and given to farmers applying for it, under the condition that it be grown for seed. This will involve an expenditure out of the revenue of a few hundred pounds, but when it is considered that the object sought after is the introduction into our midland districts of a new exportable product, adapted to the circumstances of small farmers, and always enjoying a ready market, the outlay seems a wise and reproductive one. Flax culture, like every new industry, may need a little nursing at the off-start, but when it is once established, in a part of the colony where some new agricultural industry is so much needed, all feel convinced that it will amply repay the sacrifice.

Reproductive Works in Tasmania.—The Select Committee on what is termed "Reproductive Works," have brought up their report of what they sat to consider, namely, new roads and tramways.

ROADS.	About Miles.	To Cost.	
1. Launceston and Ringarooma	39½	£11,040	1
2. Bridport and Scott's New Country	13½	3,294	5
3. Scott's New Country to join Rangarooma	5	1,600	0
4. Bridport and Scott's New Country Road	14	3,360	0
5. Green's Creek (Port Sorell) and West Tamar Road	...	342	19
6. Ulverstone, running southerly ...	20	9,000	0
7. Direct Huon Road, from Hobart Town to Leslie	11	8,101	16
8. North-West Bay and Sand Fly Basin Road	16	11,200	0
9. Southport and Port Esperance Tramroads	23	13,662	0
10. Tramway Cam River	6	600	0
11. Road from Cambridge to the Bluff	...	2,000	0
12. Bridge over the Leven and Forth	...	2,650	0

There is a bed of freestone twelve miles from Launceston on the line, which has been used for grindstones and building purposes at St. Leonard's, and fifteen miles from Launceston there are ridges of slate that could be used for flagging and roofing. It is in appearance similar to English slate.

Immigration in Tasmania.—The select committee appointed on the 14th July, 1864, to inquire as to whether any means could be devised whereby immigration might be encouraged with increased advantage both to the immigrant and the colony, having examined many competent witnesses, report that they commenced their inquiry with a full sense of the vital importance to the best interests of this community of an influx of agriculturists and small farmers, who could be induced to settle down and cultivate the agricultural areas contemplated by the Waste Lands Act, 1863, and have kept in view the adoption of some plan untried in Tasmania since the abolition of free grants in 1831, by which a population could be encouraged

to settle on the waste lands, and after having the guidance of a number of witnesses, have decided to recommend to your house the following plan:—That free grants of small locations shall be made to emigrants in proportion to the amount expended by them in bringing themselves and their families to Tasmania, and grants to be limited to certain areas, and to be conditional on actual residence and occupation and cultivation. No grant deed to issue until the required conditions had been fulfilled. The class of emigrants with whom this scheme might first be tried is, in the opinion of your committee, that known in Germany as small freeholders, who possess sufficient means to emigrate at their own expense. They are known to be a moral and industrial race, and your committee have evidence of such a class having proved highly useful emigrants in South Australia. If located in communities they would form the nuclei of large and thriving settlements in those neighbourhoods where the policy of the present ministry proposes to establish reproductive works. The committee confidently anticipate that some such scheme as that now propounded would further the interests of the colony, and one of the greatest recommendations would be the absolute absence of any expenses.

Salmon in Tasmania.—It is now ascertained that the number of living salmon in the breeding ponds at New Norfolk is not less than 6,000, and there is reason to believe may be as large as 10,000, instead of only 3,000 as estimated some time since; and that of trout there are quite 400.

Railways in Victoria.—The traffic returns of the Victorian railways for the month of July show the following results:—

	Number of Passengers.	Amount.	Goods.
Murray line	23,529	£761 6 4	£1,426 14 10
Ballarat line	13,176	6,069 18 8	6,988 3 2
Williamstown line	25,134	6,760 13 8	11,880 8 9

Together these results give £13,591. 18s. 8d. for passenger traffic, and £20,309 6s. for goods, making a total for the month of £33,901 5s. 5d. against £33,641 5s. 6d. taken in the corresponding month last year.

Obituary.

William Tait.—The death of Mr. Tait, of Prior Bank, formerly and long known to the public as a publisher and a politician, and from first to last held in much esteem by a large circle of private friends, took place a short time since. About 16 years ago, when Mr. Tait retired from business, he purchased the house and property of Prior Bank, near Melrose, where he has chiefly resided ever since, though still retaining his house in Edinburgh. His naturally vigorous frame and careful and temperate habits ensured him good health until last January, when a severe influenza was followed by a slight attack of a paralytic nature, from which he never quite rallied, and which was twice repeated. Latterly his weakness increased, and he died on Tuesday morning, the 4th of October. His age was 72. He was unmarried, and the nearest relative he leaves is his sister, Mrs. Adam Black. Mr. Tait was a man of very distinct individuality of character. He was able in all things to follow the bent of his own independent will, for his father, a successful builder, left him wealthy. While in business as a publisher, his easy circumstances removed from him one motive for very active exertion, and such attention as he bestowed on his profession was in a great measure directed towards the promotion of his political opinions—hence it is believed that he did not add materially to his wealth during the period of his business life. In 1832, he established *Tait's Edinburgh Magazine*. It appeared for some time in the shape and at the price (2s. 6d.) of the established magazines; but he soon reduced it to 1s., thus taking an important step in the progress of cheap literature. This periodical did much to stimulate and freshen the liberal cause, the more so, perhaps, that it was not very closely bound to party purposes. Any one who had a bold and original thing to say, if he could write tolerably, was pretty sure of getting out the "bit of his mind" in *Tait's Magazine*, however much it might offend prejudices, public or personal. Mr. Tait's politics were professedly those of an independent Radical, swayed by a strong friendly feeling to the Whig party. In the great contest for the representation of Edinburgh in 1847, when a coalition was formed between the radicals and the tories and the teetotallers and the publicans, Mr. Tait protested against the conduct of those with whom he usually acted, and came to the hustings as the seconder of Macaulay. Mr. Tait had received a liberal education, was a considerable reader, and enjoyed literature both when he was concerned in its practical furtherance and in the ease of his retirement. One of his chief enjoyments was in music, and he was no mean performer on the pianoforte. He was above the ordinary size, handsome and strong built, with an erect walk and a certain grave expression, caused by absence of mind, to which he was a good deal liable. He was a good, easy, kindly man at heart—affectionate to relations, and attentive to friends, of whom a large circle will long and sincerely mourn his loss.

Publications Issued.

The Reptiles of British India, by Albert C. Günther, M.A., M.D. (published for the Ray Society. R. Hardwicke).

A History of the Spiders of Great Britain. By John Blackwell. (Ray Society. R. Hardwicke.)

Military Surveying, including the principles of Topographical Drawing, by Capt. Lendy, F.G.S., F.L.S., Director of the Practical Military College, Sunbury. (Atchley and Co.)—This work, Capt. Lendy states, is chiefly written for the benefit of the large majority who have no knowledge, or, at all events, an elementary knowledge only, of military surveying. The work is illustrated with a beautiful collection of plates showing the various methods of representing ground, &c.

Pisciculture et Culture des Eaux, by P. Joigneaux. (Paris: Libraire Agricole.)—This work, in addition to treating generally on the subject, gives a history of it, and a summary of such of the French laws as affect the fresh-water fisheries.

Importanza Economica dei Pesci et del loro Allevamento Artificiale. (Torino: G. Favale e Comp.)

Dictionary of Geography, Descriptive, Physical, Statistical, and Historical, forming a complete general gazetteer of the world, by Keith Johnston, F.R.G.S. New edition, 1864. (Longman and Co.)—The original title of this work, as it appeared in 1854, is retained but the work itself has been entirely rearranged. The various alterations of territorial boundaries in Europe and elsewhere, consequent on the political changes which have taken place since that period, are noted. The progress of colonization in our own and the French colonies and geographical discovery are duly noted, as well as the numerous localities in the United States which have of late come into notice connected with the struggle between the Federals and the Confederates. The text is contained in 1,402 pp., closely printed in double columns. The population of each place is given from the latest official returns, the trade and products noted, the shortest sea and land routes given between places of commercial importance, with notes on climate, &c.

Forthcoming Publications.

Chemical Technology, by Messrs. Richardson and Watts (Baillière), a new volume (600 pp.) of the Illustrated Scientific Library, will appear in November. It will contain articles on aluminium, sodium, soda, potash, artificial stone, phosphorus, lucifer matches, hyposulphite of soda, borax, mineral waters, saltpetre, nitric acid, gunpowder, gun-cotton and fire works, with description of their properties, mode of manufacture, and applications.

Ganot's Physics, experimental and applied. (Baillière.)

Notes.

Electric Telegraphy.—The statistics of the telegraphic system in the United Kingdom—that is, of the telegraphs open to the public, for there are many purely private lines—are remarkable and interesting. The capabilities and operations of the system have steadily increased year by year. In 1861, there were 11,528¾ miles open; in 1862, 12,711½ miles; while last year the lines were extended to cover 13,892¾ miles, which, however, consisted of 65,012½ miles of separate wires. The number of stations was increased in proportion, and last year there were 1,755 open, containing 6,196 instruments, through which about 3,400,000 messages were sent. In addition to the lines actually on British soil, the submarine lines to Calais, Boulogne, Dieppe, Jersey, Ostend, Hanover, and Denmark, with which the other lines are more or less all in connection, cover 887 miles, with 2,683 miles of wire. This line has upwards of 3,000 stations in foreign countries. The messages sent by it to and from foreign countries were in 1861, 230,000; in 1862, 310,595; and in 1863, 345,784, while the mileage was not increased. The several lines were last year, Electric and International, 8,230 miles of line and 39,042 of wires, 1,022 stations. The number of messages sent by this company during 1863 has not been ascertained, but, calculating the proportion of increase from the returns of the two years immediately preceding, may be estimated at nearly 2,000,000. The British and Irish Magnetic, 4,196¾ miles, 17,257½ miles wires, 464 stations—827,424 messages; South-Eastern Railway, 316 miles, 2,642½ miles wires, 94 stations, and 62,968 messages were sent; London and Brighton Railway, 212 miles, 541½ miles wires, 46 stations—43,208 messages; London District, 107 miles, 430 miles wires, 81 stations—247,606 messages; and the United Kingdom, 831 miles, 5,099 miles wires, 48 stations, whence 226,729 messages were forwarded.

Scientific Expedition to Mexico.—Several distinguished men of science have been appointed to proceed to Mexico, and some have already sailed. Two engineers, Messieurs Guillemin and Cognet, known by their voyage to Madagascar, are to examine the mines. M. Brasseur de Bourbourg, who is known as having examined deeply into the history and language of the Astecs, is to pursue his studies of the interesting subject of early American civilization. M. Boucourt, a painter attached to the Museum of Natural History, is to explore the mountains of the country; this artist returned from Siam five years since with a splendid collection of sketches and a vast mass of specimens of natural history. M. Méhédin, another artist, is joined in the commission; he has made an expedition to Egypt and Syria and brought home some very fine photographs from the banks of the Nile; he also originated an ingenious method of taking copies of hieroglyphics and other carvings on stone by means of thick moistened paper, which dries quickly and hard under an eastern sun, weighs comparatively nothing, and yields an excellent cast in plaster. The mode of working is simply to wet the paper and press it carefully into the design with a sponge. Three or four years since a facsimile of an Egyptian obelisk, covered with figures and inscriptions, was exhibited by M. Méhédin in the Palais de l'Industrie; this was produced by the process referred to, but the moulds themselves were set up and brushed over with whitewash or something of the kind. The illusion was complete; no one imagined the material to be other than stone.

The Hastings and St. Leonard's Industrial Exhibition.—The Hastings and St. Leonard's Working Classes' Industrial Exhibition was formally opened on Monday, the 17th inst., under the most auspicious circumstances, in the Temperance Hall, Norman-road West, Hastings.

Crinolines.—"We lately mentioned," says the *Nord*, "that a manufactory at Lyons had received an order for 300,000 kilogrammes of steel bands for making crinolines. That quantity, which at the first glance might appear exorbitant, is far below the reality. One house alone in Paris sells annually 600,000 kilos. of those hoops. In order to form an idea of the extent of that branch of commerce the calculation must be made that every woman or girl has at least two of those articles of dress, each weighing on an average 500 grammes, being one kilogramme of steel for each person. As, therefore, the adult female population amounts to 12,000,000, it is that number of kilos. of steel which is annually used for the fairer portion of the French people."

Railway Statistics in France.—It appears, from a a publication issued by the Ministry of Agriculture and Public Works, that the total length of railway open to the public during the year 1862 was 57,209 kilometres (five-eighths of a mile each), which produced 2,000,735,007f., or an average of 34,962f. per kilometre. The receipts per kilometre in the different countries of Europe were as follow:—France, 45,781f.; Great Britain and Ireland, 40,417f.; Saxony, 37,152f.; Austria, 33,709f.; Prussia, 30,945f.; Belgium, 29,712f.; Wurtemburg, 27,068f.; German Duchies, 26,423f.; Russia, 26,045f.; Holland, 26,008f.; Hanover, 24,007f.; Italy, 22,070f.; Bavaria, 21,737f.; Spain, 20,966f.; Denmark, 15,207f.; Portugal, 9,801f.; Turkey, 5,028f.; and Sweden and Norway, 4,383f. The cost of construction of the French lines, consisting of a network of about 20,000 kilometres, is estimated at an average of 362,950f. per kilometre, at the charge of the companies. If that outlay is compared with the gross receipts of 45,781f. per kilometre, which is reduced by the working expenses (about 40 per cent.) to 27,469f., the result will be that the capital invested in the form of shares or obligations produces a revenue exceeding 7½ per cent. Such a return, without being excessive, would be satisfactory if the companies could consider it to be definitely acquired, but such an illusion is not to be permitted. There still remain 10,000 kilometres to be opened, and admitting that they will produce an average of 30,000f. per kilometre, this second portion of the French network will only leave a clear income of 15,000f., deduction being made of 50 per cent. for the working expenses, the proportion of which increases as the gross receipts diminish. So that the net produce per kilometre being destined at a future date to amount to 21,234f. 50c. only for the whole of the French network, that average will represent but 5f. 85c. per cent. of the capital invested, a rate corresponding exactly with that at which the companies contract their loans. As to the engagements to assure the execution of the French lines, entered into by the public treasury, which has to aid the companies in paying the interest on the capital absorbed when they are unable to do so themselves, the guarantees granted to the railway companies may be estimated as likely to amount in eight or ten years to 30,000,000f. annually. There is no doubt a considerable sacrifice, but one justified by the grandeur of the work which will then be accomplished.

The American School of Mines.—The immense value of the mineral deposits of the United States is so well known to Englishmen that it has long been recognised by them that the judicious application of capital is all that is required to elevate the mineral industries of the country to that proud position of being first in contri-

buting to the general wealth of the nation. Hitherto great inconvenience has arisen from the difficulty of obtaining reliable information from America as to the peculiar merits or disadvantages of any particular mineral property brought under the notice of English capitalists; there were no American engineers who especially devoted themselves to the subject, and English engineers, specially sent out, were necessarily unacquainted with the peculiarities of the districts reported upon. The difficulty will henceforth be removed; a well-constituted School of Mines, the first session of which will open on November 15, being now attached to Columbia College, New York, the principal chairs having been given to the most competent men that could be found, many of whom have honourably distinguished themselves at the Imperial School of Mines at Paris, and other schools of equal reputation. The standard of instruction will be as high as in any of the mining colleges of Europe, and the advantages which must thus accrue to the mineral interests of America can scarcely be over-estimated. It must be particularly gratifying to Englishmen to find that Columbia College should be first to found so important an institution as the American School of Mines, since that college must ever remain a connecting link between England and America. It was originally founded as King's College, New York, by George III., at the same time as the now celebrated University of Gottingen; and although some trifling internal dissensions for a time prevented Columbia College from attaining the distinction of its twin sister, it is to be hoped that impediments no longer exist to its onward progress, and that both as a school of mines and as a university Columbia College will be known and respected throughout the world.

A New Discovery in Pompeii.—The recent excavations at Pompeii have led to another interesting discovery. A square block of white marble was found near the Isis gate, on the sides of which the Roman calendar is engraved. Each side contains three months in three columns, over each the zodiacal sign of the respective month. Interesting, and for some even important, notices are written against the days, with regard to astronomy, agriculture, and the religion of the Romans. Thus the days of the religious festivals, &c., are accurately marked. Near the top Apollo is seen driving the chariot of the Sun, whilst below, near the base, Ceres is engaged collecting corn into a sheaf. This curious remnant of bygone days is now placed in the museum at Naples.

Revived Corks.—The attention of the French public has been called by M. Stainslaus Martin to the employment of refuse corks as dangerous to public health. It is the custom of the Paris scavengers to collect those which are brought down by the sewers, and sell them to persons who make it their business to revive them. If the corks are of unsightly shape they are re-cut; while, if containing holes, these are filled up with mastic, and then smeared with a powder to give them a proper colour. Such corks used only to be employed by the ink and blacking makers, but their low price (5s. 6d. per 1,000) has of late induced retailers of bottled beverages to purchase them. M. Martin asks if there be not ground for alarm lest some of these corks may have been formerly used to stop bottles containing poisonous substances; for although a good cork is not permeable, a bad one, full of holes, may readily become the receptacle of particles of verdigris, carbonate of lead, arsenic, or an infinity of other poisonous substances, which may be more or less soluble in water, wine, beer, cider, vinegar, milk, or oil. The *Medical Times* expresses a hope that these revived corks may never give rise to juridical errors, causing the innocent to be declared guilty.

Illumination of Street Names.—Several attempts have been made to render the titles of the streets of Paris as visible at night as in the day time, and at last apparently with success. The labels in the neighbourhood of the Hôtel de Ville are now lighted up in the following manner:—The frame in which the letters are set is made in the form of a rectangular trough, the upper and lower portions being pierced with holes to allow of proper ventilation, and within this is a gas pipe with a number of small jets according to the length of the tablet, and, consequently, the number of transparent letters to be illuminated. The upper part of the box, or trough, opens to allow of lighting and repairs, and is closed by a counterpoise concealed in the stonework of the walls. We are not informed yet of the cost of this very useful arrangement. It was only in 1728 that the streets were marked with their names; previously to that time it was a mere matter of local knowledge and tradition, and it is little wonder, therefore, that the names of many streets and other places became so altered and vulgarised that it is now very difficult to trace their derivation. Of this, the street now called *Rue Gît-le-Cœur* is a remarkable instance; there are two or three readings of the original meaning, but none of them satisfactory. The probability seems to be that the present title is the corruption of a proper name.

Discovery of Vestiges of the Ancient Aqueduct of Alatri.—M. P. Secchi has sent to M. Elie de Beaumont, for the Paris Academy of Sciences, an account of his discoveries at Alatri, famous for its supposed Pelasgian origin, and its so-called Cyclopean walls. Situated on the summit of a mountain of the Apennine range, it was entirely without water, and the valley around it was nearly four hundred feet deep. A well-known inscription records that L. Betilienus Varus brought water for the town from the neighbouring heights by means of an aqueduct 340 feet high, and that for this work he constructed strong arcades and pipes. Surveys ordered by the Pope for the present supply of the town have given rise to the discovery of the ancient aqueduct throughout nearly its whole length. The level of the lowest part of the construction agrees exactly with the figures of the inscription quoted above, and thus we find an aqueduct with a reversed syphon, under a pression of eleven atmospheres, constructed 160 years before the commencement of the Christian era. The dimensions of the piers of the aqueduct are about six feet by four feet and a half, and it is calculated that the conduit was sufficient to furnish the public baths and fountains and the whole of the town, which is found to be crossed in every direction by leaden and earthen pipes. Near the Acropolis have been found some brazen pipes, which are believed to be referred to in the Latin words of the inscription, as *fistules solides*. The aqueduct is constructed precisely according to the rules laid down by Vitruvius; and it is carried on a level with the Acropolis for about three miles, then descending the side of the mountain to the lowest point, runs again on a level for 500 or 600 yards, and then again ascends. At present nothing but the foundations remain.

Correspondence.

Dwellings of the Labouring Poor.—Sir,—In the papers of Thursday (21st October), Lord Stanley is reported to have declared at Lynn that the law of settlement wanted amendment. The papers the next day reported that the Duke of Rutland had said at an agricultural meeting as follows:—" He had observed in almost all the speeches that had been made this year at agricultural dinners—and he had observed it with the greatest possible pleasure and satisfaction—allusion had been made to the condition of the labourer, and more especially to the condition of the labourers' cottages. This was a question which it was for the welfare of the agriculturists of this country to consider. It was important, no doubt, for them to consider the comparative merits of artificial and farm-yard manures; the rotation of crops, and what they should grow instead of wheat was, no doubt, also important; not less important was the question whether the steam plough was an implement that would repay them

for the outlay, or whether it was an expensive toy. Important as all these and a hundred other questions were, paramount and foremost of all was the condition of the labourers and the condition of their cottages. The labourer was the substratum of the soil—the man whose hands must carry out whatever they intended to do, and the man the value of whose labour produced the value of the land." I beg leave to suggest to you that you should carefully examine the newspapers published since the Conference on this subject at the Society of Arts, and extract shortly the opinions of the several speakers on the subject of the dwellings of the poor, The collection will be very useful for reference hereafter. I suggest also that the Council with this subject adopt the course they successfully followed with that of copyright. Immediately on the opening of Parliament let a large deputation be organised to wait upon Lord Palmerston to urge that the government take up the matter and devise the necessary remedies. The Society and others may suggest, but the responsibility for finding out and doing what is needful rests clearly with the government of the country. If this be done, the Society will be in much better position to hold its annual conference later in the session, and take stock of what has been done since the last meeting.—I am, &c., A Member.

Squares of London.—Sir,—In last week's *Journal*, "P.," who has lately returned from Paris, institutes a comparison between the small "*places*," with their brilliant verdure and bright flowers and our own Leicester-square. Gardening might equally well be applied to the churchyards of many parishes in the centre and suburbs of London now falling into neglect and decay from the uncertainty which prevails as to their future destiny. A circular from the proper authorities of each churchyard to surviving representatives, to put their memorials in order, the removal of such as had fallen into decay and unclaimed, a tree or a flower bed placed therein with the judicious eye of a landscape gardener, would change that which is becoming an obnoxious reproach to all concerned into spaces of beauty and moral value in our midst, and secure from future desecration the open spaces, which the Chancellor of the Exchequer pointed out at Farnworth was the crying want of great and growing cities and would remind the authorities—that property has its duties as well as its rights—and prevent any fidgetty promoter of money-getting joint-stock companies from turning his attention in that direction.—I am, &c.,
Henry Webber.

The Elementary and Final Examinations.—Sir,—The experience of the last eight years has incontestibly proved the great value of the Examinations of the Society of Arts to the members of mechanics' and similar Institutes; and I believe it will be found that the Elementary Examinations will, when fairly tried, prove of yet greater advantage, because they will be applicable to a much greater number of candidates, and not only stimulate class instruction, but assist Local Committees in preparing candidates for the Final Examinations. An examination, even if unsuccessful, is a great assistance to the candidate; and from the many opportunities for observation which I have had as Secretary of the West Riding Educational Board, I am convinced that those candidates who have been submitted to previous examinations are almost in all cases the most successful. The system of Elementary Examinations which was commenced in 1862, has hitherto been but very partially adopted, and as it has proved of great value where it has been tried, I give a brief summary of my experience during the last few weeks as Visiting Officer of the Society of Arts in the Yorkshire district, in the hope that it will encourage similar efforts, and induce many other Institutes to follow their example. On Friday, 16th September, I visited Slaidburn, a small town in the Bowland district. There was a large meeting in the Court House, the rector of the parish in the chair. On the platform were four other clergymen, two country gentlemen, and Messrs. Jonathan and Robert Peel were only prevented from being present by a domestic calamity. After an address from the chairman, Mr. Wilkinson, a large landed proprietor, presented no less than eleven Elementary Certificates to members of the Mechanics' Institution. The most lively interest was taken in the proceedings, and the meeting was one of the most crowded ever remembered. On Wednesday, 21st September, there was a large meeting in the Town Hall, Leeds, when Sir Stafford Northcote, Bart., M.P., presented a very large number of certificates and prizes to the successful candidates at the Elementary, the Society of Arts, the Science Class, and the Universities' Examinations, held by the West Riding Educational Board. There were full reports of the able speeches on the occasion in *The Times* and other newspapers. On Friday, 23rd September, I was at the annual meeting of the Bradford Mechanics' Institution, which was very fully attended. Alderman Law, who was in the chair, presented a large number of certificates and prizes to the successful candidates at the Society of Arts, local, and School of Art Examinations. On Monday, 26th September, I attended a meeting of the Stockton Mechanics' Institution, when Joseph Dodds, Esq., the chairman, presented several certificates to successful candidates at the Elementary Examinations, and expressed himself so well pleased with the scheme that he offered five guineas to be given in local prizes next year. Mr. Joseph Byers, late Mayor of Stockton, and an old member of the committee, said he was much gratified with the proceedings; he feared that the Institutes were degenerating into mere news-rooms and libraries, but the Elementary Examinations were restoring them to their legitimate functions as educational institutes. On Friday, 30th September, I was present at the annual meeting of the York Institute of Popular Science and Literature. S. W. North, Esq., the chairman, presented several of the Society of Arts Certificates to successful candidates, after which I explained the system of Elementary Examinations, and recommended its adoption. The Rev. H. V. Palmer, Mr. Dyson, and other members of the committee expressed their great approval of it, and an animated discussion showed the interest which was excited. On Saturday, 8th October, I attended the annual soirée of the Hebden-bridge Mechanics' Institution, which was held in the Ebenezer School-room, and was fully attended. H. W. Horsfall, Esq., who was in the chair, presented two senior certificates to successful candidates at the Elementary Examinations, after which I addressed the meeting, and pointed out the many advantages, not only to the members but to the Institute, and the most lively interest was manifested. On Monday, 10th October, I was present at the annual soirée of Pudsey Mechanics' Institution. There was a very full attendance, and Alderman Carter, of Leeds, was in the chair. I gave an explanation of the mode of conducting the Elementary Examinations, and pointed out the many advantages which would be obtained by its adoption. On Wednesday, 12th October, I was at Faversham, in Kent, where the Mayor, F. W. Monk, Esq., presented the Society of Arts Certificates to members of the Institute who had been successful at the Examinations. I called the attention of the meeting to the importance of adopting the Elementary Examinations, and the next day had a conference with the Committee of the Kent Association of Institutes on the subject. On Monday, 17th October, I attended the annual soirée of Hunslet Mechanics' Institution, the large hall of which was filled. The Mayor of Leeds, O. Nussey, Esq., was in the chair, and there were also present three aldermen and three town councillors of Leeds. The chairman presented to successful candidates twelve Elementar Certificates and three prizes, given by the West Riding Educational Board, beside two Certificates of the Society of Arts. The proceedings excited considerable interest,

and Alderman Blackburne, the President, offered £6 for local prizes next year. On Wednesday, 19th October, I was present at a meeting of the Thirsk Mechanics' Institution, which was fully attended. Sir William P. Gallwey, Bart., M.P., was in the chair, and had the agreeable duty of presenting to the successful candidates at the Elementary Examinations no less than forty-five certificates and six prizes given by the West Riding Educational Board, besides six prizes given by the Institution for success at the Elementary Examinations. On Friday, 21st October, I met a full Committee of the Ossett Mechanics' Institution, to confer with them on the public presentation of six Elementary Certificates and one Prize, given by the West Riding Educational Board, which had been gained by members of the Institution. The President offered three local prizes for next year's Examinations, for which active preparations are being made, though the Institution labours under the disadvantage of having no building. Besides the above, meetings have also been held at Middlesborough Mechanics' Institution, and Acomb Literary Institution, for the presentation of Society of Arts and Elementary Certificates, but I was unable to attend them on account of other engagements.—I am, &c., Barnett Blake.

MEETINGS FOR THE ENSUING WEEK.

Tues. ...Anthropological, 8. 1. Mr. C. Carter Blake, "On the Anthropological Papers read at Bath." 2. Capt. R. F. Burton, "On a Visit to Dahomey."

Thurs...Linnæan, 8. 1. Mr. Moggridge, "On some Orchids of the South of France." 2. Mr. Bentham, "On *Leptolobium*."

Chemical, 8. 1. Prof. Wanklyn, "Isolation of Electro-negative Radicle Valeryl." 2. Messrs. Graham, Stuart, and Baker, "Existence of Nitrogen in Steel." 3. Mr. W. Baker, "Concentration of Nickel in Lead by Pattinson's Process." 4. Prof. Church, "Effect of Ignition on Garnets, &c.," and "Colouring Matter of Certain Rocks."

Patents.

From Commissioners of Patents Journal, October 21st.

Grants of Provisional Protection.

Albumen, substitute for—2428—R. A. Brooman.
Alumina, treatment of sulphate of—2407—A. A. Croll.
Ammoniacal preparations—2432—R. Laming.
Aniline, &c., rendering soluble colours in crystals derived from—2411—R. A. Brooman.
Arms, breech-loading—2349—W. Greener.
Boots and shoes, manufacture of—2209—P. A. Le Comte de Fontainemoreau.
Break blocks—2401—G. Lindsley.
Bricks, &c., manufacture of—2440—T. Dobson.
Cocks, valves, and taps—1473—P. B. O'Neill.
Cocoa nut, separating coir fibre from the husk of—2431—G. T. Bousfield.
Collars, cuffs, &c., machinery for embossing, &c.—2414—W. E. Newton.
Cotton, machinery for ginning—2406—J. T. Pendlebury.
Cotton, machinery for opening and cleaning—2392—W. Crowther.
Distilling apparatus, steam machinery and sea water—2410—W. H. Graveley.
Drilling braces and screw keys—2395—S. Alley.
Engines—2331—E. R. Handcock.
Fabrics, apparatus for coating and flocking—2422—J. H. Johnson.
Filter presses—2101—G. Davies.
Fruit dressing machine, portable—2091—W. H. Barnicoat & D. Barr.
Hair brushes, mounting rotary—2412—J. Jennings.
Hinges, manufacture of—2426—W. E. Gedge.
Human body, surgical appliances for the support of parts of the—2409 C. G. Gumpel.
Hydrostatic rotary engine, obtaining continuous motion by means of a —2335—B. W. A. Sleigh.
Injectors, adapting and applying pneumatic—2334—J. Rhodes.
Iron pipes, apparatus for casting—2357—W. Scott.
Knitting machinery, needles employed in—2427—L. and C. Cashmore.
Ladders, construction of—2421—H. Druce.
Ladies' boots—2408—H. J. Keer.
Lighting and ventilating—2393—C. Defries.
Liquids, fermentation of—2394—J. Watts.
Locks, latches, &c.—2446—H. A. Bonneville.
Loom, projecting the shuttle of a, through the shed—2291—F. Tolhausen.
Looms—2417—J. S. Grimshaw.
Looms—2450—G. H. Castree.
Money, apparatus for counting—2390—J. Schneuhr.
Motive power, transmitting—2433—J. H. Johnson.
Oils, machinery for refining—2342—A. H. Brandon.
Pipes, machinery for moulding—2333—P. Barr.
Printing cylinders—2400—R. A. Brooman.
Purses, books, &c., fastenings for—2434—C. Shether.
Purses, boxes, &c., fastenings for—2381—W. Clark.
Quarries, tiles, bricks, &c., kilns for burning—2398—T. Bennett.
Railway carriages, breaks for—2429—S. Bateman.
Railway trains, communicating signals in—1755—E. Burstow.
Railway trains, communicating, watching, and signalling throughout—2165—J. Barber.
Railway trains, signalling between passengers and guard—2083—J. S. Farmer.
Railway turn-tables—2445—C. Greenway.
Reaping or mowing machines—2418—P. Winton.
Resinous substances, purifying—2443—J. and T. Johnson.
Rifles, &c.—2403—H. C. Hurry and E. Wilson.
Sails, reefing—2399—G. Allix.
Sails, reefing and furling—2438—T. A. Swinburne.
Screw threads, apparatus for forming—2439—E. Davies.
Ships, bolts used in the construction of—2236—J. H. Ritchie, jun.
Shop fronts, &c., apparatus for lighting—2290—F. Tolhausen.
Soda, &c., decomposing common salt in the manufacture of—2413—J. Johnson.
Springs, railway carriage, &c.—2404—W. F. Henson.
Steam boilers, apparatus for heating—2441—A. Monro.
Steam engines—2437—G. Haseltine.
Steam engines, slide and cut-off valves for—2391—A. Cuthell.
Tap, high pressure non-leakage—2085—S. Sharp and A. Doubble.
Tea, coffee, &c., obtaining extracts from—2420—E. Loysel.
Thread, machinery for winding—2452—H. Conant.
Vehicles—2415—W. Clark.
Ventilators—2435—T. K. Callard.
Vessels, registering the course steered by—2350—W. Arthur.
Welding metals—2436—H. J. Standly and W. Prosser.
Wire fences, manufacture of—2419—E. O. and J. Greening, and H. Shield.
Wood, application of thin strips of, to new and useful purposes—2378—G. Davies.
Yarns and threads of silk, apparatus for dressing, &c.—2416—R. M. Hands.

Inventions with Complete Specifications Filed.

Furnaces, &c., moving grates or fire-bars for—2569—J. Zeh.
Power looms—2532—W. E. Gedge.

Patents Sealed.

987. S. Harrison and W. Clements.
989. J. P. Harriss.
1009. F. Potts and C. Harvey.
1017. G. F. Harrington.
1018. J. Thompson.
1019. J. E. Duyck.
1024. G. J. Worssam.
1026. T. P. Tregaskis.
1028. D. Lewis.
1029. D. Hussey.
1030. J. M. Pratt.
1033. T. H. Holderness and H. Jordan.
1035. F. G. Grice and H. Bennett.
1036. H. Bennett.
1037. J. Dodge.
1038. J. F. Brinjes.
1039. H. Marsden.
1040. W. Crofts.
1043. J. Symes.
1044. D. Harris.
1045. G. Haseltine.
1047. W. Taylor.
1049. T. S. Truss.
1051. W. Thorold.
1054. L. A. Durrieu.
1055. J. White.
1056. T. J. Searle.
1060. R. A. Brooman.
1063. L. E. C. Martin.
1064. J. Cookson.
1066. R. Melling, jun.
1067. C. O. Papengouth.
1069. A. Notman.
1073. M. A. F. Mennons.
1083. W. C. Cambridge.
1101. J. Hunt.
1110. S. Shaw and H. Fishwick.
1136. E. Beanes & C. W. Finzel.
1138. A. V. Newton.
1151. A. Barclay.
1169. J. F. Empson.
1171. J. Whitehead, sen., J. Whitehead, jun., and D. and H. Whitehead.
1172. H. Aitken.
1195. A. Alison and J. Halliwell.
1207. H. A. Bonneville.
1233. W. E. Newton.
1301. J. Baird and J. McIntyre.
1631. J. Corby.
1651. G. F. Graham & W. Payne.
1681. B. F. Sturtevant.
1699. G. Haseltine.
1966. G. A. Nowell.
2076. G. G. Boggio.
2113. G. Haseltine.

From Commissioners of Patents Journal, October 25th.

Patents on which the Stamp Duty of £50 has been Paid.

2597. C. D. Abel.
2616. C. De Bergue.
2635. H. Frost.
2650. A. Morel.
2625. F. A. Calvert.
2632. J. H. Johnson.
2652. G. Davies.
2680. B. J. La Mothe.
2649. J. F. V. Deliry.
2654. J. H. Johnson.
2656. I. L. Pulvermacher.
2662. J. C. Heaton and J. Dean.
2665. J. McCall and B. G. Sloper.
2666. R. A. Boyd.
2744. R. Mushet.
2669. E. Chambers.
2638. F. O. Ward.

Patents on which the Stamp Duty of £100 has been paid.

2672. H. Wimball.
2673. E., H., and F. C. Cockey.
2695. T. and J. Hamilton.
2758. W. Shields.
2707. J. Macintosh.
2731. A. West.

THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, NOVEMBER 4, 1864. [No. 624. Vol. XII.

TABLE OF CONTENTS.

Announcements by the Council.

NOTICE TO MEMBERS.

The One Hundred and Eleventh Session of the Society will commence on Wednesday, the 16th instant, when the Opening Address will be delivered by Wm. Hawes, Esq., F.G.S., Chairman of the Council.

On Wednesday, the 23rd instant, a Paper by Wm. Fairbairn, Esq., LL.D., F.R.S., "On the Application of Iron to the Purposes of War and Naval Architecture," will be read.

The Chair is taken at Eight o'clock.

The following are the dates of Meetings for the Session:—

1864. November	—	—	16	23	30
,, December	7	14	21	—	
1865. January	—	—	18	25	
,, February............	1	8	15	22	
,, March...............	1	8	15	22	29
,, April	5	—	19	26	
,, May..................	3	10	17	24	31
,, June	—	—	—	28*	

There will be three Courses of "Cantor" Lectures on the following subjects during the ensuing Session:—

"On the Relation of Science and Art to Manufactures." By B. Waterhouse Hawkins, Esq., F.G.S.

"On the Application of Geology to the Arts and Manufactures." By Professor D. T. Ansted, M.A., F.R.S.

"On the Application of Chemistry to the Arts." By Dr. F. Crace Calvert, F.R.S.

These Lectures are open to Members free of charge, and a Member has the privilege of introducing ONE Friend to each Lecture.

* The Annual General Meeting: the Chair will be taken at Four o'clock. No Visitors are admitted to this Meeting.

Particulars of the Courses will be duly announced in the *Journal.*

The following Institutions have been taken into Union since the last announcement:—

Nailsworth Literary and Mechanics' Institution.
Oswestry Literary Institution.
Hamilton Mechanics' Institution.
Christchurch Working Man's Institute.

DECAY OF WOOD CARVINGS.

The Commission appointed to inquire into the causes of decay in wood carvings and the means of preventing and remedying the effects of such decay, have made their report. The committee consisted of Thomas Graham, Chairman, John O. Westwood, W. Gibbs Rogers, Peter Graham, J. C. Robinson, John Webb, John G. Crace, George Wallis, Secretary. The instructions received from the Committee of Council for Education were to inquire into the causes of decay in wood carvings, with the view to preserving the valuable decorative examples, being public property, now in the South Kensington Museum, and the committee divided their attention to:—1. The various causes of decay, and best means of arresting it; 2. The means which it would be safe to adopt with objects already much damaged; 3. The enclosure of objects in glass cases,—if likely to promote decay and dry rot; 4. The best means of preventing the commencement of decay. As to question 3, the Commission are unanimous in opinion that no injurious effects could possibly follow such a course.

On the causes of decay the Commission have been guided by the facts brought before them by J. O. Westwood, Esq., M.A. Hope Professor of Zoology, Oxford (their colleague), whose report on this point they insert *in extenso*, as follows:—

"The insects which in this country are found to be the most injurious from their habit of burrowing into the wood of furniture, belong to three species of beetles, of small size and cylindrical in form (the better to enable them to work their way through the burrows in the wood), belonging to the family *Ptinidæ*, and known under the systematic names of *Ptilinus pectinicornis*, *Anobium striatum*, and *Anobium tessellatum*.

"The first of these is about one-fourth of an inch in length, and the male is distinguished by its beautiful branched antennæ; the second, which is by far the commonest and most destructive, is about one-eighth of an inch long and of a brown colour, with rows of small dots down the back; and the third is about one-third to one-fourth of an inch long, the back varied with lighter and darker shades of brown scales.

"These insects are produced from eggs deposited by the females in crevices of the wood-work, from which are hatched small white fleshy grubs, resembling the grubs of the cockchafer in miniature, which generally lie curled upon their sides, making very little use of their six small feet fixed near the head; it is in this state that the insect is chiefly injurious, although the perfect insect itself also feeds on the wood. These grubs make their burrows generally in the direction of the fibre of the wood; but when it becomes thoroughly dry and old, they burrow in all directions.

"When full grown they cease eating, cast off their larva skins, and appear as inactive pupæ or chrysalids, with all the limbs lying upon the breast enclosed in little sheaths; after a short time the perfect insect bursts forth.

"In this country, according to my own observation, the appearance of the insect in the perfect state takes place uniformly during the first hot days at the beginning of summer. I believe the beetles are long lived in their final form; as they may be met with during the summer, but the greater number seem to come forth simultaneously: such is certainly the case with *Ptilinus pecticornis*, as it has attacked my own bedpost, and I have annual opportunities of observing its appearance and have much lessened its numbers by destroying every specimen, for which, of course, I am on the look out. The powers of destruction possessed by these insects is extraordinary in cases where they find a piece of furniture suitable to their taste. I have known a new bedstead completely reduced to powder in three years, and where they do take a liking to a piece of furniture, they seem to devour every particle of the woodwork, and as the perfect insects possess large wings beneath their hard wing sheaths, they are often seen flying in the hot sunshine out of doors, evidently in search of suitable woodwork for themselves and their progeny. I have had the deal flooring of an underground room destroyed by the *Anobium striatum* and they are also equally destructive to beams and rafters of houses, churches, etc., making their entrance at the ends if the beams have been varnished (which of course teaches us that the ends of the beams should be rendered obnoxious to them by coats of paint or saturation). In the perfect state, the insects of the genus *Anobium* are well known under the name of the "Death Watch," as these insects produce the ticking noise occasionally heard in old houses. It is also the *Anobium striatum* which is so injurious in libraries, the grub burrowing through entire volumes, and feeding upon the paper and especially the *pasted* backs of the books.

"The destruction of these insects, when enclosed in articles of furniture, is by no means easy, although, with care, much mischief might be prevented. The saturation of the wood with some obnoxious fluid previous to its being used up in the manufacture of objects of value would, I should think, be beneficial. When manufactured, of course the size of the object affords a greater or less degree of facility in operations for the destruction ot the grub.

"In the cases of articles where many smaller pieces of wood are joined together, saturation would be dangerous, as would also the placing of small objects in tin boxes and subjecting them to heat by plunging the tin case into boiling water (a practice which we employ to destroy the grubs which get into our insect boxes).

"Various infusions have been used for saturation, amongst which creosote appears to be the most effective. It has in fact been found that the woodwork of the jetties at Plymouth saturated with creosote have resisted the action of the marine insects which have done so much damage to the wooden marine erections all round the coast.

"A strong infusion of colocynth and quassia, spirits of turpentine, expressed juice of green walnuts, and pyroligneous acid, have all been proposed. In hot climates the ravages of the *Anobium* on books has been prevented by washing their backs with a fluid compound of corrosive sublimate (10 grains) and 4 ounces of alcohol, and the paste used in the book covers is there also mixed with alcohol.

"Herr Temmnick preserved his books from the *Anobium* by dipping them in a solution of quassia. Except on a small scale, however, the saturation of furniture seems scarcely practicable. Fumigation seems however to be more available. For small objects I know no better plan to destroy the *Anobium* than that which has been adopted successfully at the Bodleian Library on my recommendation, against the book worm, namely to enclose a number of volumes in a box, shutting quite close, and placing a small quantity of benzine in a saucer at the bottom of the case. The same plan might be adopted with small ornamental wood-works, enclosing them in glass cases shut as nearly air tight as possible. This plan in fact seems to me the most efficacious and answers one of the special questions submitted to the commission. I think it very beneficial to enclose infected objects in such cases, as it enables one to examine them at liberty day by day through the glass, and ascertain whether any powder falls from them, caused by the working of the larvæ or when the perfect insect appears. I believe in this manner, small objects might be freed from the ravages of any larvæ which they might have in them. Of course, if left exposed, they would at a future time (*i.e*, at the commencement of the following summer, when the *Anobia* appear in the perfect state) be subject to a fresh visitation and therefore continual enclosure in glass would be a perpetual protection against the insect, which I need not say is not an inherent object in the constitution of the wood, but one which accidentally finds its way there.

"Fumigation, even, on a large scale, might be adopted by having a room made as air-tight as possible, stopping up the chimney, pasting the window-frames, etc., and placing infected furniture in it, burning brimstone or filling the room with fumes of prussic acid or benzine; this plan is adopted with success for the destruction of another obnoxious domestic insect, and I believe would also answer against the *anobium*, especially if practised at the time when the perfect beetles make their appearance; their destruction at that time involving, of course, the prevention of further injury by their progeny."

With regard to the best means of stopping the decay, when commenced, it was decided that certain experiments should be carried out to ascertain the effect of the treatment proposed by the chairman and by Professor J. O. Westwood; and the matter, for this purpose, was placed in the hands of the secretary, Mr. George Wallis. These experiments were carried out to the satisfaction of the commission, and the course of proceedings and the results are as follow:—

At the end of April, 1863, when, from the appearance of certain specimens of carved work, the worm appeared to be developed and active, a large glass case, made as air-tight as circumstances would permit, was filled with examples of furniture, &c. The bottom of this case was covered with white paper, and the specimens of woodwork were raised above the surface by placing blocks of wood at convenient points. This insured the free circulation of the vapour over the whole surface of the objects. A dozen small saucers, with pieces of sponge saturated with carbolic acid, were distributed about the bottom of the case.

The carbolic acid was renewed every three or four days for a month, and a strong vapour pervaded the case for that period, during which there was no appearance of worms, dead or alive. At the end of May the saucers were removed, and the doors of the case thrown open, so

that it might be well ventilated and cleared of vapour, after which it was closed again, but the saucers were not replaced. This closing of the case without using the vapour was to prevent the escape of any beetles which might make their appearance in the event of the vapour of the carbolic acid not having destroyed the worms. About the middle of June, a fortnight after the case was closed again, beetles were seen crawling upon the white paper with which the bottom was covered. These beetles would, no doubt, deposit their ova in the usual course, and as they could not escape, a considerable number of them were found dead upon the white paper with which the surface underneath the carved work was covered.

In order to test the efficacy of chloroform and benzine, two small glass cases, as nearly air-tight as possible, were selected, in which were arranged, early in May, specimens of ornamental wood-work, all more or less in bad condition from the worm. The bottom of each, as in the previous experiment, was covered with white paper, and the objects to be acted upon raised upon small blocks of wood. In one case chloroform was used, and in the other benzine, in a similar manner to the carbolic acid.

Within a week after the experiment commenced it was evident that the action of the chloroform had destroyed the worms as they came to maturity, and in a fortnight all the specimens of carved work having been taken from the case, and the dust produced by the action of the worms shaken out, a number of dead ones were found, as also some dead beetles; but these were evidently those of past seasons.

On examining the specimens of carved work placed in the case treated with benzine, there was no appearance of worms or beetles dead or alive. The two cases, with their contents, were then kept open for a week, and thoroughly ventilated to clear them as far as possible of all fumes of either chloroform or benzine.

After this they were closed again, being then free from all traces of vapour, and they have been kept closed ever since. Throughout the summer, the temperature being the same as that under which beetles appeared in the case treated with carbolic acid, no traces of worms or insects were visible, nor could the remains of any be discovered on the white paper, with which the lower surface of each case was covered. It would appear then that the action of the vapour of carbolic acid is not sufficient; whilst chloroform and benzine are volatile and penetrating. The experiment with chloroform appears to prove that the vapour kills the worm, and as no beetles appeared in the case during the summer, it may be inferred that it killed all the worms within its influence.

The Commission infer that benzine is more effective than even the chloroform. It certainly might have happened that there were no ova in the articles placed in the case treated with benzine, and therefore there would be no worms developed to kill; but this is not probable from the condition of the specimens and the statement of the attendant in whose charge they had been in the Museum.

As regards saturation, the experiments were made with corrosive sublimate, dissolved in methylated spirits of wine, as suggested by the Chairman; the object being to ascertain the effects of this upon the surface of the wood, as regards grain and colour. The solution was mixed to the strength of half an ounce of corrosive sublimate in half a pint of methylated spirit, but this was evidently too strong a solution. One experiment was upon a small carved and fluted column which had been varnished or partially French polished. The specimen had been already submitted to the action of the vapour of chloroform. The result on the surface was simply to slightly disturb and renovate the varnish or polish. Another experiment was made upon a portion of an ancient wood cornice which had been placed in the case in which the carbolic acid had been used. The decorated portion had originally been stained and varnished, but the specimen was bare at the back. The whole was saturated with the mixture by laying on with a house-painter's sash tool. The visible effect upon the stained and varnished surface was simply to renovate the varnish and stain. A third experiment was upon a piece of carved poplar, which was free from all surface treatment and just as left by the carving tool. The grain of the wood was not raised by the solution; but after it was dry, the carving had the appearance of having been varnished. This would be decidedly objectionable in all cases in which it might be desirable to preserve the original colour and unpolished surface of the wood. No experiment as to the effect of saturation in a solution of corrosive sublimate in water, as used by Mr. Rogers at Belton, was made. Because of the great risk to delicate carvings or pieces of furniture by their immersion in water, or the bringing up of the grain of the wood by treatment with a brush; and because the vaporisation by benzine appears to be quite sufficient to destroy the larvæ, whilst the methods suggested under the head "Prevention" appear likely to accomplish the object of warding off future attacks.

On the subject of restoration, the facts communicated by Mr. W. G. Rogers are the most important, and may be considered as decisive as to the practicability of restoring the most delicate works to as nearly as possible their original condition, and even by this restoration rendering them proof against the attack of the larvæ in future. In 1855 the carvings by Grinling Gibbons, at Belton House, were in such a condition as to render it absolutely necessary that something should be done to prevent their complete destruction. To this end, they were placed in the hands of Mr. W. G. Rogers, who reports that the first step he took was to have the various pieces photographed, as a means of recording the position of each detail of the ornamentation, &c. The whole of the works were in a serious state of decay, portions being completely honey-combed by the worm. In order to destroy or prevent any future development of the insect within the wood, Mr. Rogers caused the whole to be saturated with a strong solution of corrosive sublimate in water. The colour of the wood, however, suffered so seriously by the action of the mercury, that it was found necessary to adopt some means of restoring the original tint. This was effected by ammonia in the first instance and subsequently by a slight treatment with muriatic acid. After this, the interior of the wood was injected with vegetable gum and gelatine, in order to fill up the worm holes and strengthen the fabric of the carvings. A varnish of resin, dissolved in spirits of wine, was afterwards spread on the surface, and then the dismembered pieces were put together, in conformity with the photographs taken as records prior to the work of restoration having been commenced.

The present condition of these carvings, seven years after the operations detailed had been completed, is reported as completely satisfactory.

As regards the prevention of decay or attack by the insect, the saturation with spirits of wine and corrosive sublimate, as proposed by the chairman, from giving the effect of a slight varnishing it would, in many cases, be objectionable. From experiments tried by Mr. Peter Graham, it appears the desired object can be attained without in the slightest degree changing the appearance of the surface of the wood. Mr. P. Graham caused specimens of carving, on which no preparation whatever had been used, to be coated with thin, clear, parchment size, such as that used by gilders and others. This, being an animal substance, is not attacked by the worm, which feeds on vegetable matter. The specimens experimented upon by Mr. P. Graham showed no appearance of any surface treatment after having been gone over with the size.

The Commissioners, however, suggest that it would be desirable to mix a small quantity of corrosive sublimate with the size before applying it, in the proportion of say sixty grains to a pint of the size.

The conclusions at which the Commission arrived are,

1. That the action of the worm may be arrested and the worm itself destroyed by vaporisation, more especially by the vapour of the benzine, as appears from the experiments reported, and also from the successful results arrived at in the Bodleian Library, at Oxford, in the destruction of the book worm.

It would be advisable to have a room, sufficiently large to take in any piece of carved work or furniture which may be required by the museum, which may show symptoms of decay. This room should be so constructed that it can be closed and made as perfectly air-tight as possible, but with means of renewing the benzine placed in saucers from time to time as it evaporates, without opening the ordinary means of access or entering the chamber; as also of ready ventilation after the objects are considered to have been sufficiently treated, and before any person enters the room for the purpose of removing them.

The process must always be carried out during the spring and early summer months, according to the state of the temperature and the observations of those in charge of the carved work, as to the action of the worm, which is manifested by the fine dust falling from the worm-holes, crevices, &c.

2. That the practicability of complete restoration of carved work is fully shown in the results of Mr. Rogers' labours at Belton, as detailed. The important question, however, as to the restoration of gilded carved work, and of panels on which pictures have been painted, and which have been attacked by the worm, presents difficulties which, at present, there seems to be no means of overcoming; as in neither case could the objects be immersed in water, or submitted to the action of gelatine. That the worm could be destroyed by vaporisation, as in all other cases, appears certain, and there is no reason to suppose that the vapour of the benzine would influence either the gilding of the one or the colours of the other, especially if applied in the latter case to the back of the picture.

3. That after the worm has been destroyed by the course of action proposed, further attacks from it can be prevented by treating the carved work with a solution of corrosive sublimate, either in methylated spirits of wine, or parchment size, according to the surface character of the carving or wood-work; the strength of the solution, in each case being, as before stated, 60 grains of the chloride of mercury to a pint of fluid, whether spirits of wine or parchment size.

In a note appended to the report by Mr. George Wallis, it appears that the cases treated with chloroform and benzine were kept for observation throughout the spring and early summer months of 1864. As there appeared to be some action going on in the first named case, the final examination of both cases was deferred until 1st August. In the case in which chloroform had been used, the worms had been active, especially in one piece of wood work, as a considerable amount of dust fell from it when shaken, and a number of newly made holes were distinctly visible. No beetles could be discovered, nor were any worms found which could be considered as the development of this year, although several fell from the holes, evidently of last year's growth, as they were very dry. Nine small objects in carved wood had been placed in the case treated with benzine, in which, as stated in the report, no appearance of life was manifested in 1863. On examination, eight of these were again found without the slightest appearance of new dust, although all of them had been seriously worm-eaten before placing in the glass case. The ninth specimen, in poplar or willow, had evidently been the subject of their operations. The dust inside showed that the worms had been developed this year, and had attacked the top and sides of this casket, whilst four dead beetles were found, three inside the casket, and one a few inches outside of it on the white paper with which the bottom of the glass case remained covered. All the operations of the insect in this glass case had been confined to this casket; neither dust, dead worms, nor beetles, were found in or near any other object. The glass case on being opened smelt strongly of the benzine, although it had been left open for a period in 1863, as stated in the report. From these facts it would appear that the ova deposited previous to the objects being subjected to the action of chloroform or benzine, were not all developed in 1863, the season in which the experiments were made; and that in any future action based on the experiments reported, this fact should be taken into account, and the vaporisation repeated more frequently than would otherwise have been necessary if all the ova of one year were developed and came to maturity in the next.

Proceedings of Institutions.

Bacup Mechanics' Institution.—The distribution of the Prizes and Certificates won by students of this Institution in the Science and Art Department, Society of Arts, and Lancashire and Cheshire Union Examinations, took place on Thursday, October 20th, Mr. J. Greaves in the chair. The chairman delivered the prizes to the successful candidates in the following order:—Alfred W. Andrews, Lancashire and Cheshire Union; certificate. William H. Barr, Science and Art Department: Inorganic Chemistry, 1st class Queen's Prize; Organic Chemistry, honourable mention. Society of Arts: Chemistry, 3rd class certificate. James Greenwood, Lancashire and Cheshire Union; certificate. James Grime, Lancashire and Cheshire Union; certificate. William Lord, Science and Art Department: Inorganic Chemistry, 1st class Queen's Prize; Organic Chemistry, 2nd class Queen's Prize. Society of Arts: Arithmetic, 1st class certificate; Algebra, 2nd ditto; Chemistry, 2nd ditto. John Lord, Society of Arts; Arithmetic, 3rd class certificate. James Morton, Society of Arts: Arithmetic, 2nd class certificate; Chemistry, 2nd ditto. Henry Nuttall, Science and Art Department: Inorganic Chemistry, 1st class Queen's Prize; Organic Chemistry, 3rd class ditto. Society of Arts: Arithmetic, 2nd class certificate; Chemistry, 3rd ditto. John Robert Pilling, Lancashire and Cheshire Union, certificate. William Pilling, Lancashire and Cheshire Union: certificate; Arithmetic, prize £1. James Pilling, Society of Arts: English History, 3rd class certificate. John H. Rakestraw, Lancashire and Cheshire Union: certificate. Joseph Shepherd, Lancashire and Cheshire Union: certificate. Geo. Wm. Sutcliffe, Lancashire Union: certificate. Science and Art Department: Inorganic Chemistry, 1st class Queen's Prize; Organic Chemistry, 3rd class ditto. George Howarth Stewart, Science and Art Department: Inorganic Chemistry, 2nd class Queen's prize; Organic Chemistry, passed. Robert Stewart, Science and Art Department: Inorganic Chemistry, 3rd class Queen's Prize; Organic Chemistry, passed. Society of Arts: Arithmetic, 3rd class certificate; Chemistry, ditto. Robert Stewart, Society of Arts: Arithmetic, 1st class certificate; Algebra, 3rd ditto. James Howker Smith, Society of Arts: Arithmetic, 3rd class certificate. John Whitaker, Lancashire and Cheshire Union: certificate. Joshua Lord Wolfenden, Science and Art Department: Inorganic Chemistry, 2nd class Queen's Prize; Organic Chemistry, honourable mention. Society of Arts: Chemistry, 3rd class certificate. James Walsh, Science and Art Department; Inorganic Chemistry, 2nd class Queen's Prize; Organic Chemistry, 3rd class ditto. Society of Arts: Arithmetic, 3rd class certificate; Chemistry, 3rd ditto. Several recitations were given, and the Newchurch hand bell ringers played some pieces of music. Votes of thanks were given to the chairman and others, which brought a good evening's entertainment to a close.

Newport Athenæum.—The monthly journal of this Institution states as follows:—"It has recently been pro-

posed to the directors of the Newport Athenæum to take the necessary steps for the formation of a Local Board of Examiners in this town, in connection with the Society of Arts. The proposal is one that demands attention, and we are assured that the directors will be quite prepared to proceed in the matter, when a sufficient number of members have signified their desire to become candidates at the approaching examination."

Fine Arts.

Rouen Demolitions and Improvements.—It is next to impossible to let light and air into a town, to convert crooked alleys into straight and wide streets, to create open spaces where, previously, a mass of old houses was intersected by narrow and tortuous lanes, without giving offence to the antiquarian, and running the danger of being called Iconoclast by the archæologist. Whether the site be London, Paris, or Rouen, the improver must be prepared, not only for opposition from those who are invaded, but also for complaints from those whose reminiscences and sympathies are interfered with. The Iconoclasts, if so they must be called, of Rouen, will not escape the usual fate; they will be accused of destroying what can never be replaced, and of having substituted modern common place for picturesque antiquity; yet they seem to have been as considerate as possible in the matter, and never to have obliterated a worthy specimen of antiquity except where the health, necessities, or conveniences of living men, women, and children absolutely demanded it. Besides secondary alterations, two fine new streets, at right angles to each other, and forming a cross of which the long arm runs almost due north at right angles to the river, and, on the map, reminds one of the "signature" of William the Conqueror, or Richard Cœur de Lion, on the old charters referred to last week, have been driven through the very heart of the old town, and at the intersection of this cross is a large square, planted with great taste, and christened Place Solverino. On this spot existed some of the oldest houses in Rouen; and where now are brilliant grass plots, trim gravel paths, shrubs and flowers in gay luxuriance, and many of which would have recalled to the eye of Richard Cœur de Lion the lands of his brave antagonist Saladin, and cast iron garden seats for the good folks of the nineteenth century, a few years since was a mass of picturesque houses which could scarcely be called habitations, and streets which scarcely deserved the name of thoroughfares. Many very curious and some beautiful old fronts and gables have been demolished, but there is no help for it, and the student must look for them now in the illustrations of books, in the delightful works of a Turner or a Prout, or in the more matter of fact productions of the camera. But if the demolitions have obliterated a good deal of what was curious and interesting in Rouen, it has brought many of the great attractions of the place out of shadow, and has facilitated access to them. The glorious church of St. Ouen now stands between a beautiful pleasure ground and a large place at the end of one of the new streets, and if the Hôtel de Ville, an ugly building, in *quasi*-Corinthian style—an old convent with a modern face—did not abut against the north transept of the church, the latter would be exhibited in all its grandeur and beauty. A secondary street throws open to view the curious church of St. Maclou with its beautiful painted windows. The tower of St. Laurent, perhaps the finest in Rouen, is also disengaged from the buildings which formerly half hid it from view; and St. Godard, St. Patrice, the picturesque Palais de Justice, St. Vincent, the tower of the renaissance church of St. André; the famous old belfry, the *Tour de la Grosse horloge*, commenced, as the quaint old inscription says, in "MCCCXXIIII. and nine," and finished in "MCCCXXIIII. and eighteen,"—a roundabout method of writing 1333 and 1342—and many other remarkable buildings, are on or near to the line of these two principal new streets, and are thus rendered far more accessible for the visitor. These two grand streets are named the *Rue de l'Imperatrice*, and the *Rue de l'Hotel de Ville;* they form the principal features of the new town, and their architecture is not unworthy of the locality which they bisect. The authorities have not fallen into a servile imitation of the streets of Paris, but have selected a style of building which is peculiarly suitable to the habits as well as the character of the town. The houses are not, like those of Paris, composite buildings, divided into apartments for the accommodation of a dozen or more families, but are, with few exceptions, single residences, and, consequently, on a much smaller scale than those of the capital. The style almost universally adopted is that of late renaissance, in red brick of excellent quality, relieved, very liberally, by facings of Caen stone, and although, as a rule, the houses are not much ornamented, the doors, balconies, and other conspicuous features are treated with much boldness, and generally with good taste. On the whole New Rouen, although totally unlike, is not unworthy of the capital of Normandy, and when completed will do honour to its renovators, who have had extraordinary difficulties to cope with, smallness of means being one of the greatest. Visitors to France will do well to break their journey and give a few hours at least to the new town, the old edifices, the museums, and the Galleries of Rouen, not omitting, beyond everything, the famous old Hôtel de Bourgtheroulde in the Place de la Pucelle, where Jeanne d'Arc is said to have been burned. Montfaucon, Ducarel, Dibdin, Cotman, and Dawson Turner have all dwelt lovingly on this remnant of the middle ages; De Joliment, Nodier, Taylor, and de Cailloux have made known its beauties by graver and pencil; and Le Provost and Barabe have made it the subject of special memoirs. It was commenced about the end of the fifteenth century, by Guillaume La Roux, Lord of Bourgtheroulde, who was alive in 1486, and finished in the early part of the following century by his son, also Guillaume, who was Abbé of Aumale and of Val Richer, and was employed by François I. in the negotiation of the Concordat. The building consists of a house in the peculiar style of the period, and another building at right angles with the former, evidently more recent, and apparently erected to supply the want of large state rooms in the former. The fronts of both are covered with sculptured bas-reliefs, executed on the walls themselves. The subjects in the original house are chiefly pastoral, and are disposed over the walls in almost as free a style as the ornaments on a Japanese cabinet, but the sculptures on the subsidiary building are arranged in a regular manner. The front of the last-named portion consists of a door and three windows, all highly decorated, and beneath the latter are large bas-reliefs of the famous meeting of Henry VIII. and François I. on the field of the cloth of gold. The outer panels represent each of the monarchs with their retinue, while that in the centre exhibits their meeting. Over the windows is a sculptured frieze, the subjects being evidently scriptural or allegorical. Altogether the Hôtel de Bourgtheroulde is one of the most remarkable buildings of its period, and is, moreover, in very good preservation, although it has fallen from the condition of a noble residence to that of a house of business. The interior has suffered terrible changes, but one small octagonal chamber on the first-floor in the tower, forming a part of the older portion, is in good preservation, and its carved woodwork and decorated ceiling present excellent examples of the interior ornamentation of the period.

Photography.—The Photographic Society of London has just distributed among its members a reduced copy of Mr. Robinson's composition photograph—"Bringing Home the May."

The National Gallery.—The National Gallery has just been enriched by the magnificent gift of Lord Taun-

ton of his celebrated picture of the Annunciation, by Carlo Crevelli, signed and dated 1481. The other acquisitions during the vacation are—a portrait of Christofero Longono, a Milanese nobleman, by Andreo de Solario, dated 1505; "St. Rock with the Angels," by P. Morendo, dated 1518; and a portrait of a Venetian Senator, by Bonsignori, signed and dated 1487. The gallery will be re-opened to the public on Monday, the 7th instant.

Manufactures.

LARGE LOCOMOTIVE.—The late Mr. Stephenson constructed a powerful locomotive for mounting sharp inclines and turning curves of small radius, by coupling two engines back to back; each of these weighed about twenty-seven tons, and the locomotive thus constructed drew double its own weight at the rate of twelve miles an hour. Such is the account given by a French engineer of the locomotive in question. M. Petiet, chief engineer of the Chemin de fer du Nord of France, has recently constructed a locomotive with the same object; in this case two engines are united in one machine, having four cylinders and twelve wheels coupled. It has no tender, and carries its own fuel and water, and when loaded weighs in round numbers sixty tons. The heating surface is equal to about 265 square yards. This locomotive is said to have drawn a train, weighing 250 tons, a distance of nearly 4,000 yards with several gradients, of which the sharpest was eighteen in the thousand, with three curves of little more than three hundred yards radius. M. Petiet says that it could act perfectly on a curve and counter-curve of 135 yards diameter in a distance of little more than 200 yards. After the above experiment in traction had been made, the locomotive was placed at the rear of the train, and pushed the train backwards over the same ground with perfect ease. M. Petiet believes that if it were ever necessary to work curves of eighty or ninety yards radius only, it would simply be necessary to augment the amount of play given to the two central axles of the machine carriage. The experiments were accompanied by a difficulty which arose from the construction of the bridges, which were not high enough to permit the engine to pass through without lowering its chimney. The trials took place in the presence of the Government Engineers of Roads and Bridges. The railway from Turin to Genoa, for which we believe this engine has been constructed, has inclines as great as 35 in the 1,000, but the report says nothing about the capacity of the new locomotive in such cases.

EXPLOSIVE MATERIALS.—A very interesting operation, which attracted a great number of spectators, was performed recently, at St. Ouen, near Paris. A large floating dock on a new construction—210 feet long, 36 feet wide, and 18 feet high—was launched on the canal. This great iron boat, or floating dock, is intended for a store, to hold all descriptions of spirits, oils, or other inflammable liquids. These substances, which are so frequently the cause of disastrous fires on land, are now to be secured on water, where they will be comparatively safe from fire. Each of the 100 compartments into which the iron boat is divided is sufficient to contain 250 hectolitres. Ten similar floating warehouses are to be built for the company of the docks of St. Ouen, of which five are already on the stocks. The iron boat was launched sideways into the canal of St. Ouen. After having glided along the slides placed under it, the iron mass, once in the water, moved forward more than forty yards by the force of impulsion. The operation was performed with complete success.

CANADIAN EXHIBITION.—The annual provincial exhibition of Upper Canada was held this year at Hamilton, on the last four days of September. About 30,000 persons paid for admission. The articles exhibited were more than 6,000 in number, the live stock exceeded 2,000; but the exhibition included also not only agricultural implements and farm products, but manufactured goods of all kinds' works of fine art, and ladies' work. Of the reaping and mowing machines the judges reported that though there was considerable difference in the quality of the work done, it was all well done; the machines, as a whole, wrought well, no breaking down, no total failures. The samples of grain exhibited were pronounced extremely good, and the judges considered that the statements generally made of the failure of crops must have been somewhat exaggerated. The president, Colonel Johnson, in closing the exhibition, gave a statement (from the return apparently of 1860 or 1861) that the production of grain, peas, beans, and potatoes in the State of New York amounted to 27 bushels per head of population, in Pennsylvania 32 bushels, in Michigan 42, in Ohio 49, but in Upper Canada nearly 56 bushels per head. He stated that the season just closed had shown the importance of drainage. The farmers who had their lands drained were able to get in their crops at a time when soils undrained could not be worked at all in consequence of the spring rains; and it was remarkable how slight the effects of the drought of this summer had been upon drained land as compared with undrained. But the yield, he said, taking all the various productions of the field into account, is likely to prove somewhat below the average.

ENORMOUS SHEFFIELD CASTING.—In July last a successful attempt, by Messrs. J. M. Stanley and Co., the Midland Works, was made to cast an anvil block weighing 160 tons. The enormous mass of iron took six weeks to cool, and it was then, by means of hydraulic power, lifted from the mould. Last week the same firm were engaged in casting a second anvil of precisely the same size and weight. The mould, which was twelve feet square at the base and eleven feet six inches deep, was dug out in the centre of the workshop, and from five furnaces constructed at intervals round the building, the molten iron was run. The first furnace was "tapped" at six o'clock in the morning, and in about twelve hours the mould was filled. The opportunity was embraced by Messrs. Stanley for testing their newly-patented rotary engine. An ordinary engine of 12-horse-power was used to drive a portion of the blow-fans. It was worked at a pressure of 80lbs., and the fans made 1,400 revolutions per minute. The new engine, which is of 10 horse-power, drove fans of the same dimensions, was worked at the pressure of 50lbs., and the fans made 1,600 revolutions per minute. The new engine worked much easier than the one on the old principle, and consumed about half the quantity of fuel. The enormous castings referred to are intended for the gun manufactory of Messrs. Firth and Sons. For months past men have been engaged preparing for them "beds" of extraordinary solidity, the necessity for which will be apparent when it is known that each anvil has to receive the blows of a twenty-five-ton Nasmyth hammer. Extensive alterations are going on in the steel melting department at the works of Messrs. Firth. The building intervening between the steel melting furnaces has been removed, and other furnaces in its room erected. When completed, there will be, in a space of 160 feet long by 60 feet wide, 170 melting pots, and an ingot of steel of from twelve to fourteen tons weight will be turned out at one casting. In the centre of this department will be erected a powerful steam crane.

PARIS EXHIBITION OF 1867.—It is not absolutely settled where this coming Universal Exhibition is to be held. There was a general impression abroad that the building commenced by the unfortunate Permanent Exhibition Company, at Auteuil, would be made available for the purpose. It is admirably situated for such a purpose, standing as it does at the junction of three main roads: a railway, an American tramway, and the river; while the foundations and a considerable amount of the stone and iron work are executed. The Champ de Mars has been under consideration of the authorities, but there is probably an objection to shut up so fine a theatre for

military exhibitions for one to two years; and now it is said that it is probable the site of the exhibition of 1855 will be again employed. But the Palais de l'Industrie is much too small for the purpose, and large annexes would be absolutely necessary. It will be remembered that on the former occasion the machinery was placed in a long building erected on the Quai de la Conference, that a large circular building, formerly a panorama, which stood between the two, was also used, and that all three were united together by means of the garden, and a wooden rialto, which passed over the ordinary road and the tramway. There are two great objections to a repetition of this arrangement, namely, the cutting up of the Champs Elysées, which have been beautifully planted since 1855, and the interruption of the traffic along the quays. The Parisian public was rather surprised the other day by a statement to the effect that the building for the 1867 exhibition would be built over the Seine, and, strange as it may appear, the rumour is not unfounded. M. A. Barrault, formerly engineer-in-chief of the Palais de l'Industrie, has written to the editor of the *Opinion Nationale*, protesting against the project attributed to him, of placing the new building under a tunnel, covering the Seine from the Pont d'Alma to the Pont de la Concorde (a distance of full 4,000 feet), but he admits that he is occupied on a plan, of which the scheme has been presented to the Emperor, and of which the following is an outline:—M. Barrault proposes to make use of the Palais de l'Industrie, and to erect additional buildings over the Seine, which flows at little more than 200 yards from the building in question. He proposes to cover the Seine to the extent of 350 mètres, or more than a thousand feet, by means of wood-work nearly level with the quays, which are much higher than the level of the river, and supported by beams resting on piers built in the stream; this erection to be connected with the Palais de l'Industrie by means of a large covered gallery crossing the public road and the quays. One advantage claimed for this curious arrangement is that the public will have means of direct access to the exhibition on each side of the river.

Commerce.

Postage between France and England.—This subject is still discussed, and as the consideration of points connected with it may aid in the establishment of a more liberal arrangement, it is well to keep the public mind informed upon the subject. The French press has echoed the complaints of the public on several points, and the authorities have felt compelled, at last, to reply to the various statements and queries put forth. As regards the demand for an increase of weight for letters passing between England and France, the official note says, in reference to an article in the *Debats*, "The writer asks how stands the negotiation between the two countries with respect to the postal tariff, and states that England proposes fifteen grammes ($\frac{1}{2}$oz.) for the initial weight of international letters, now fixed at $7\frac{1}{2}$ grammes. In this case again no negotiation is on foot. The English office would doubtless gladly accept the weight of half an ounce (a little less than fifteen grammes), but this could not be accepted by France, as the standard of weight for a single letter on the one hand, because it does not correspond with any division of the metrical system, and on the other, because France, having adopted the weight of the gramme for its inland service, cannot accord to strangers what she refuses to her own population." The latter portion of this reply has some weight, but it is inconceivable how any one in authority could pen the former part relative to the fifteen grammes, when that is just the weight used for Paris and the whole of the department of the Seine, which supplies a vast proportion of the whole correspondence of the country, and is, moreover, used, with its multiples, over and over again in the scale of charges for printed matter. When the official writer points to the fact that a newspaper costs a penny for the shortest postal distance in England, and only eight centimes when sent "from Marseilles to the Orkneys," and that while the French post-office carries a small printed circular for one centime, the English office charges a penny, or ten centimes, for the smallest scrap, it is clear that the post-offices of the two countries are neither consistent with each other nor with themselves, and the sooner they become so the better will it be for the commerce, the private interests, and the revenue of both countries.

Steamers at Panama.—There are already no less than nineteen steamers a month arriving at and departing from the Isthmus of Panama, viz.:—The regular line from New York; two lines from Europe; steamers from Carthagena and Nicaragua; steamers running on the South Pacific coast and on the coast of Central America, besides lines to California. The Central American line has just been obliged to add a third steamer of larger capacity. By another year cotton will probably become an important staple in nearly all the Southern republics.—*Panama Star*.

Traffic Returns.—The traffic receipts of railways in the United Kingdom amounted, for the week ending the 8th October, on 11,596 miles, to £688,405, and for the corresponding week of last year, on 11,261 miles, to £622,450, showing an increase of 335 miles, and of £65,946 in the receipts. The gross receipts on the fourteen principal railways amounted, in the aggregate, on 8,216 miles, to £561,060, and for the corresponding week of 1863, on 7,994 miles, to £507,325, showing an increase of 222 miles, and £53,735 in the receipts.

Trade with Foreign Nations.—The Select Committee appointed to inquire into the arrangement between the Foreign Office and the Board of Trade in reference to the trade with Foreign nations, have considered the matters to them referred, and have agreed to the report. They come to the conclusion that the mode of procedure must be by the Foreign Office consulting the Board of Trade, and upon that supposition they had brought before them two suggestions:—1st. That there should be, within the Foreign Office itself, an officer or officers who should take special charge of the correspondence of the Board of Trade; and 2ndly. That the Board of Trade should be put in direct communication with the members of the consular and diplomatic services upon commercial matters. The committee continue:—Upon the first of these suggestions different opinions have been expressed, but, after carefully weighing them, your committee are of opinion that such departmental change would be of service. To the second of these suggestions the committee have devoted much of their time; on the one hand, the advantages of direct communication between the department whose duty it is to promote commerce and those servants of her Majesty whose duty it is to watch the interests of such commerce abroad are self-evident. On the other hand, inasmuch as the members of the consular and diplomatic service must be appointed by the Foreign Office, it may be inconvenient for them to be in communication with any other department. Your committee, however, agree with the Earl of Malmesbury, and with Sir Emerson Tennent and Mr. Mallett, the two gentlemen who have the charge of foreign commerce at the Board of Trade, in the belief that there will be no danger of collision between the two offices if all correspondence with consuls and foreign ministers pass through the Foreign Office, so that the Foreign Secretary could acquaint the President of the Board of Trade if the instructions of the latter be at variance with his own. Your committee think that if the Board of Trade were thus enabled to carry on communication through the Foreign Office, that department would be more quickly informed of such facts as it is its duty to public; would be able more speedily to serve the interests of individual merchants; and, in transactions in which its opinion is asked by the Foreign office, to obtain that full information

without which its opinion is of little value. Your committee conclude with the following recommendations for the improvement of the relation of the Foreign Office to the Board of Trade:—1st. That the Board of Trade be placed more nearly upon an equality with the Foreign Office than it is at present, in order that its opinion, when asked, may have due weight, and that its chief be always a member of the Cabinet. 2ndly. That the Board of Trade be put in direct communication with the members of the diplomatic and consular services, and that such communication be carried on through the Foreign Office, with such provisions as shall prevent collision. Lastly. That an office or officers be appointed in the Foreign Office to conduct its correspondence with the Board of Trade.

Calais Harbour.—It has long been felt that the basin of Calais is far too small for the commerce of the port; in fact, it is so small that vessels have sometimes to wait for weeks, to the great cost and inconvenience of their owners, before they can land their cargoes. A project for enlarging the port has been drawn up for some time, but military considerations have heretofore stood in the way. It is said that these have now all been removed, and that the work will be proceeded with immediately. The extent of the floating basin will be nearly doubled, and the quays will be increased from 530 to 1,100 mètres in length, when, it is calculated, there will be room for the reception and unloading of all the vessels that arrive even in the busiest part of the year.

Animal Manure Manufacture.—The *Chemical News* says:—"In the *Journal d'Agriculture Pratique*, M. Barral gives some interesting details on the subject of the manufacture of animal manure at Aubervilliers. This manufactory consumes every year 8,000 horses, 200 donkeys, 300 cows, 300 pigs, 9,000 cats and dogs, 6.000 kilogrammes of meat unfit for food, 500,000 kilogrammes of offal from the Parisian abattoirs, and 600,000 kilogrammes of other refuse animal matters, such as skins, horns, &c. The raw material is first cut up and boiled to extract the grease. The flesh is then separated from the bones, pressed, and dried. It is afterwards ground and sifted, and the dried bones, which are also submitted to the same process, mixed with it, forming a manure containing 35 per cent. of nitrogen and 55 per cent. of phosphate of lime. The blood is collected separately, and also made into manure. The soup obtained in the boiling is strained, and the solid matter thus collected is added to the rest. The offal is piled in alternate layers with other organic matter, such as wool and parings of horn and hoofs, with which is mixed a certain amount of mineral phosphates. The heap is well moistened with the strained soup, fermentation is set up, and the whole is gradually transformed into excellent manure. During this process the phosphate of lime breaks up into phosphoric compounds, more or less soluble, and various salts of ammonia are formed. This is really a much better use to put dead horses to than making them into *saucissons de Lyon* or *filets de bœuf* for the cheap *restaurateurs*.

Coal in France.—Although extensive coal mines have been discovered in the department of Calais, during the last few years, the import of English coal does not in any way diminish. The following statistics will serve to show the increase in the consumption of coal in France during the last 75 years, in tons—

	Consumption.	Imported.
1789	500,000	220,000
1811	773,000	....
1830	2,400,000	600,000
1840	4,290,000	1,290,000
1845	6,200,000	2,200,000
1852	7,900,000	3,000,000
1860	13,600,000	5,200,000
1863	15,200,000	5,200,000

It will thus be seen that of the 15 million tons of coal annually consumed in France, about two-thirds (valued at £4,712,000) are obtained in the country itself. France, however, cannot claim to be a coal-producing country, the quantity extracted in Belgium being of equal amount, and the Zollverein exceeding her, varying from 14,000,000 to 17,000,000 tons annually, whereas England, which produced 13,000,000 tons only in 1800, furnished 84,500,000 in 1862, representing a value of nearly £22,000,000. The coal districts, however, in the Pas de Calais may be said to be in a prosperous condition, the quantity produced in 1859 having been 504,390 tons against 1,192,200 tons in 1863.

Colonies.

Acclimatisation.—The following paper was read at a recent meeting of the Acclimatisation Society of Victoria:—I think it may not be unserviceable to remind those who regard acclimatisation as the new-fangled hobby of a few crotchetty enthusiasts, that it has been practised in England for a period of 1200 years—dating from the time at which the first wheat was sown in her soil—and that, up to the commencement of the sixteenth century, at which period great efforts seem to have been made for the introduction of exotic flowers, fruits, and vegetables, the mother country was singularly destitute of all these, her population subsisting, as some of the early settlers of this colony did, upon beef, mutton, and "damper." Indeed, there is a striking similarity between the condition of England in the dawn of her civilisation and that of Australia at the present time. She was both a pastoral and a gold-producing country; and her exports consisted of gold, silver, tin, copper, wool, and horses. Not to pursue this parallel further, however, I will at once proceed to point out what acclimatisation has done for England in regard to fruits, flowers, and esculents. The very rose which we adopt as a national emblem, and profess to consider so purely English, is an alien, and was brought over from France, Flanders, and Italy. The honeysuckle which garlands the hedgerows and overruns the porch of the peasant, came originally from North America; while the lavender which the farmer's wife deposits among her snow-white napery in the household linen-chest, is a native of the south of Europe. So, too, are the rosemary, the mignonette, the lily, and the pink. English shrubberies are indebted to Hungary for the "golden tresses" of the laburnum, to Portugal for the laurel, to Italy for the bay tree, and to the Levant for the weeping willow. The common daffodil, "that comes before the swallows dare," is of Italian lineage; the wild foxglove is a denizen of the Canary Isles, and the passion-flower, with its sacred symbols, is a native of South America. In fact, if you were to strip our English flower gardens, green lanes, woods, and meadows of their exotic decorations, you would rob them of half their beauty, and English descriptive poetry of half its charm. Even the hawthorn, so indispensable to the sylvan poet and the landscape painter, is derived from North America. To the best of my belief, England does not possess so much as one indigenous vegetable; and, until the time of the Tudors, what little garden stuff her scorbutic population did consume was imported from the Netherlands. You may remember that Shakspeare makes Sir Andrew Aguecheek account for the dulness of his mind by observing, "I am a great eater of beef, and I believe that does harm to my wit;" and, in the absence of any succulent vegetables, his excessive consumption of animal food is not at all surprising. Nor, considering their very restricted sort of diet, can we feel much surprise at Queen Elizabeth's robust maids of honour making such heavy meals of bread, beef, and beer as they are reported to have done. About this time, however, it seems to have occurred to our beef-eating, beer bemused, and slow-witted forefathers, that it would be cheaper to import garden seeds than vegetables, and more wholesome to eat newly-cut cabbages than to feed upon such half-rotten garbage as was brought

over from Holland in the holds of broad-bottomed and slow sailing luggers; and having once opened their minds to this conviction, they began to cast their eyes over the four quarters of the world in search of vegetables. So, in course of time, they procured broccoli, beans, and cauliflowers, from Greece; peas from Spain; carrots and celery from Flanders; asparagus and kidney beans from Asia; lettuce, artichokes, and cabbage from Holland: parsley from Egypt; and potatoes from South America; and thenceforth the kitchen garden formed as indispensable an appurtenance to the mansion and the manor house as the pleasaunce, the buttery-hatch, or the bowling-green. Of indigenous fruits also, Old England was lamentably destitute. All she could boast of was a few crude berries, growing wild upon brambles, for I am doubtful whether even the crab was native to her soil. Most of the fruits which now flourish in her gardens, hot-houses, and orchards (none of which fruits, by the way, are said—upon the authority of Mr. Hawthorne—to be comparable in flavour with an American turnip), were introduced between the years 1520 and 1600. Italy sent her the mulberry; Syria, the apple and the plum; Portugal, the grape; Persia, the nectarine and peach; Flanders, the gooseberry, the finer descriptions of cherry and the strawberry; Greece, the currant and the apricot; Austria, the quince; Spain, the pomegranate and the "oranges and lemons," so popularly associated with "the bells of St. Clement's;" and North America, the raspberry and the walnut. It was early in the same century, too, that England borrowed from the Netherlands, and planted in her southern counties the most beautiful, and withal the most useful, of all creepers—the hop plant. Imagine the condition of the people of England without bitter beer!—and without the means of brewing it, unless by the employment of obnoxious and unpalatable drugs! The beverage which has immortalised the names of Bass and Allsop, which has been the means of strewing the summit of the Rhigi and the slopes of the pyramids with the vitreous evidences of John Bull's ubiquity; which has made the tropical heat of an East Indian summer endurable; which has imparted its own briskness and sparkle to Australian picnics; and which has given Englishmen of the nineteenth century the new sensation which Xerxes ineffectually sighed for—this beverage, I say, is one of the fruits of acclimatisation, and must be taken credit for accordingly. Fully to appreciate what this beneficial agency has accomplished for the mother country, we have only to picture one of her counties denuded of every natural feature which has been borrowed from abroad. Take the county of Kent for example, and obliterate from its surface those lovely hop gardens, with their "long-drawn aisles," overrun with a living tracery of green and gold; those leafy orchards, glowing with their ruddy fruitage; those rippling fields of yellowing wheat; those picturesque hedgerows of hazel and hawthorn; those stately gardens at Knowle, Cobham, and Penshurst; those chequered masses of colour which beautify every cottager's patch of homely flowers; and the face of the country would be not merely transformed, but deformed. It would be as unlike the Kent of to-day as a noble fresco would be unlike its former self after having received a thin coat of whitewash. I leave to other and to abler hands the task of showing what acclimatisation has done for England in so far as the animal kingdom is concerned; for the subject is a wide one, and is entitled to more skilful treatment than I am qualified to bestow upon it. I have confined my attention to one particular only; and I have selected this theme because it appears to me that we ought to derive encouragement here from the knowledge of what our forefathers accomplished elsewhere, under circumstances especially unfavourable to the work; for I need not remind you, that in the sixteenth century the means of communication between the different countries of the world were few in number, tedious in operation, and liable to all sorts of obstructions. The timid scruples, sordid suspicions, and jealous fears of one nation frequently prohibited or impeded the exportation of such seed or plants as were likely to prove beneficial to another; and all foreigners were looked upon as hateful rivals or natural enemies, whom it was lawful to defraud in time of peace, and to plunder and pauperise in time of war. If this stupid and barbarous policy is not wholly exploded, it is, at any rate, discountenanced by the more enlightened citizens of the more civilised nations of the world in our time; and hence the work of acclimatisation is comparatively easy, and a gratifying reciprocity of feeling and effort is exhibited by its friends in different countries. In applying ourselves to the work in this colony, we may be animated by such a retrospective glance as that which I have taken at what has been effected in this way, with a view to multiply the means of subsistence and the modes of enjoyment, as well as to augment the attractiveness of the natural scenery and the charms of social life in England. Coming into the inheritance of these things, both as a matter of custom and right, as such of us did who were born there, we are very apt to take it for granted that they existed from time immemorial, and to think no more of them than we do of the common blessings of light and air. But when we find upon inquiry and reflection, that the energy, the enterprise, and the forethought of acclimatisers in the sixteenth century mainly contributed to make England the picturesque garden which it is in the nineteenth, we may not unreasonably ask ourselves whether it is not in our power to confer similar obligations upon those who are to come after us in Australia. When we are invited to make some little sacrifices of time and money for posterity, we should reject as a malignant insult the sneering rejoinder of "What has posterity done for us?" The question which each generation has to propose to itself under such circumstances is this, What have preceding generations done for our own? And if any man will deliberately sit down and compute the sum of his obligations—the magnificence of the inheritance he enjoys—the legacy bequeathed to him in art, literature, and science by the illustrious dead:—if he will take into account the inventions which have virtually trebled the term of his existence—which have multiplied his delights and mitigated his sufferings—which have given the day labourer of to-day the command of comforts and enjoyments inaccessible to the most powerful monarchs two centuries ago—which have made life infinitely happier and more beautiful for all than it was formerly possible to be to the most favoured children of fortune—if he will honestly calculate this debt, "the long result of time," he will be startled by its magnitude, and will feel that nothing but the basest ingratitude or the most degrading selfishness could influence him in refusing to bestow upon posterity the slender pittance it may be in his power to offer, not in requital, but in acknowledgment of what he owes to those who have departed "to join the majority." In connection with this subject we may add that the great salmon experiment appears to be progressing in Australia as satisfactorily as the most sanguine of its promoters can desire. The parr, numbering about 300 in Victoria and 6,000 in Tasmania, by the last advices were about two months old, and perfectly healthy. An important question agitating the minds of the acclimatisers was as to the best means of disposing of the Victorian contingent. Some recommended the Gipps Land rivers, and others the Gellibrand, in the Otway district; while a third section, who had an eye to the advantage of market proximity, suggested the Yarra, which runs by Melbourne, as best depository for the young salmon. To assist in the solution of the difficulty, Mr. Ramsbottom, who brought out the ova from England, and who has the superintendence of the salmon breeding-ponds in Tasmania, had specially come over from Hobart Town, and gone up the Yarra between forty and fifty miles. So far as we can learn he has seen nothing to warrant the impression that it would not make a suitable salmon stream. Watts'

Creek or Badger's Creek, it appears, would form a desirable nursery. Both are in the neighbourhood of Mount Riddell, and both are fed by springs and snow. Mr. Ramsbottom was also to proceed to Gipps Land, in order to make an inspection of the rivers in that part of the colony. An interesting discussion as to the future home of the salmon took place at the *conversazione* of the Acclimatisation Society. Mr. Ramsbottom was present. He expressed his belief that in about twelve months hence the young fish would be ready to go down to the sea as smolts, and that in another year there would be salmon in the river selected for the experiment, though it would not be fit for market. In order to preserve the salmon from poaching, Mr. Ramsbottom recommended the imposition of severe penalties for such offences until a return can be obtained. When this return comes, he says, the colony of Victoria will have about 50,000 in place of the 300 now in its possession.

River Cod.—The first fresh Murray River cod ever imported and cooked in Tasmania was served up to a dinner party at Brisbane. The fish was dispatched from Echuca on the 18th of August, 1864, and arrived by rail in Melbourne, where it was immediately put on board the steamer *City of Launceston*, and was received in Launceston on the 20th, in excellent condition. The flesh of the Murray River cod is not flaky like that of the English cod, but is very close and firm, and rather coarser, and does not possess the same flavour. The Tasmanian Rock cod, though much smaller, more closely resembles the English fish.

Victoria Railway.—The revenue of the Melbourne railway, for the four weeks ended July 27, amounted to £3,201 15s. 4d., as compared with £2,999 taken in the equivalent period of last year. Upon the Hobson's Bay and St. Kilda lines the receipts for the four weeks, ending July 27, give a total of £5,482 19s. 7d. against £4,347 18s. 7d. received in the corresponding period of last year.

Sale of Alpacas.—Ten of the alpacas recently offered for sale by the New South Wales Government have been secured for Victoria at £21 each—a sum ridiculously low, considering the enormous expense attending the importation of the animals from Peru.

Obituary.

John Leech, the prince of modern caricaturists, died on Saturday evening, the 29th of October, 1864, at seven o'clock, in the 47th year of his age, after an illness of some months. Born in 1817, and springing from a middle-class family, John Leech was placed at the Charterhouse, where he was contemporary with Thackeray, with whom in latter life he formed an intimate friendship. His friends intended to bring him up as a surgeon, and after leaving school he was placed with a general practitioner at Hoxton. The readers of Albert Smith's "Adventures of Mr. Ledbury" will recollect the extraordinary vagaries of Mr. Rawkins—a character faithfully reproduced from the original, the surgeon with whom Mr. John Leech lived, and who was a constant source of mirth to his pupil and his companions. About this time Mr. Leech determined to turn a talent for drawing, which he believed himself to possess, to some practical account, and he used to give a half-humorous half-pathetic description of his carrying half over London a large lithographic stone which he had engraved, and which he vainly solicited various publishers to purchase. About this time came the establishment of *Punch*, and very shortly after its start Mr. Leech joined the new speculation, which he at once greatly aided, and of which he eventually became the marrow and the strength. His sketches, always full of life and character, were at first very crude and rough; year by year he mellowed and improved; year by year his hand gained greater cunning, while his eye kept all its freshness; year by year he enlarged his scope and increased his knowledge of his art. Of these charming productions of his pencil there is no need to speak. It has been complained of him that he was too horsey, but it was no affectation in him to draw what he delighted in, and all his horsiness was gentlemanly and varied. He drew English women and children as no other man could, and he followed the fashion in female dress with an accuracy and a quickness that were positively surprising. No sooner was there a change in the shape of bonnets, in the mode of dressing the hair, than you found it quietly satirised in the next week's *Punch*. So keen was his observation that he frequently worked a change in the fashionable James in the street, in the articles sold by the pavement-bordering hucksters, in the slang cries and chaff of the street boys. He detested foreigners, and in his drawings dilated on all their eccentricities and imperfections with grim humour, and once remarked, "I only drew them as they are! You should see the disgusting caricature of English men and women now in every print-shop in Paris." His landscape was as wonderful as his figure-drawing; with a very few touches he brought before you what he wanted with marvellous reality—a rolling sea with flying scud and heavy clouds banking up to windward—cliffs and beach—a croquet lawn—an open hunting-country—a stubble-field—a Scotch moor—a salmon river—nothing came amiss to him. The nature of his employment, and probably a great sensitive of organisation, made him peculiarly susceptible to annoyance from noises; and to such an extent had his bodily and mental powers suffered from these that he was ordered by his medical attendants to travel abroad during last summer. He returned to England somewhat better in physical health, but even more sensitive to the torture of the street organ and similar sources of noise. He was not, however, thought by his friends to be such a terrible sufferer as he really was, and on Friday he was able to call upon his medical man and consult with him for some time. On Saturday so little apprehension was entertained of any serious result that a party of children were enjoying themselves at his house when he expired.

Publications Issued.

The Essentials of Spelling.—A comprehensive classification of the difficulties of English spelling and rules for spelling, and exercises thereon, adapted to the Revised Code Examinations, the Civil Service Examinations, and to schools generally. Third edition, revised and enlarged, by E. Jones, B.A. (F. Pitman).

Notes.

Roman Drainage.—M. P. Secchi has sent to M. Elie de Beaumont, for the Paris Academy of Sciences, an account of the discovery of a field near Alatri, beneath which exists a complete system of drainage by means of burnt clay pipes, averaging fifteen inches in diameter, more than three feet in length, and somewhat less than an inch in thickness. At present these pipes are full of sediment and clay, and lie seven or eight feet beneath the surface; but it is said to be evident that this depth has been increased by progressive deposits, and that formerly the drains were much nearer the surface. The pipes enter each other little more than an inch and a half, and there is a space of about a centimetre between the diameters, evidently to allow for infiltration. It is supposed that the field so carefully drained was the place where military exercises occurred, and which is mentioned in the inscription already referred to as having been formed by the same Betilienus, who was twice elected

Censor for his public services. At his death a statue was raised in his honour, and his son was released from military service.

EFFECT OF RAILWAYS ON INCUBATION.—A strong suspicion is afloat that the constant habit of riding in railway carriages must be injurious to the brain and the nervous system of man, and there is something like collateral evidence of this supposed fact in the effect of the vibration on the incubation of fowls in France. It is found that in the hen houses situated very near railways hatching is extremely difficult, and that vast numbers of eggs yield very few chickens, and this is attributed, with every show of reason, to the vibrations of the earth, which, of course, are the more intense and of longer duration in proportion to the length of the train and its speed, and the proximity of the line of rails.

ACCLIMATATION OF A CHINESE FISH IN FRANCE.—The Acclimatation Society of Paris has for a long time made endeavours to introduce into the waters of Algeria and the south of France the famous gourami, a native of China, but which is acclimatized in Mauritius and Bourbon, where it prospers and multiplies in a remarkable manner, and at length its efforts seems likely to be successful. M. E. Liénard, a proprietor of property in Mauritius, has transmitted to the society seven living specimens of the fish received by way of Marseilles. These have been left in charge of Barthélemy La Pommerage, the director of the Museum of Natural History of Marseilles, in order that they may become accustomed to the climate of the country.

PRODUCE OF THREE POTATOES.—The *Hants Advertiser* states that three large-sized potatoes, planted in Mr. Ransom's garden, at Hawthorn-cottage, on Southampton-common, were this week dug up, and found to have produced 362, weighing in the aggregate 71 lbs. A dozen weighed 16 lbs., and four selected from the dozen weighed 6½ lbs. The largest single potato weighed 2 lbs. 7 oz. These potatoes were planted about three feet apart, and kept well earthed up as they grew, each root forming a small mound about 18 inches high.

THE WORKING WOMEN'S COLLEGE.—This college will open on the 26th instant, at 29, Queen's-square, Bloomsbury. On that evening, at eight p.m., there will be a general meeting of students and teachers, at which the presence of intending students is particularly desired, and at which addresses will be given by the teachers explanatory of the purpose and aim of the college. Classes have already been formed in English grammar, French, arithmetic, geography, Latin, English history, geometry, drawing, social economy, English literature, and botany. There will also be preparatory classes every evening for writing, reading, and the first four rules of arithmetic.

NORTH LONDON WORKING CLASSES INDUSTRIAL EXHIBITION.—Nearly 200,000 persons have visited this exhibition since the opening on the 17th ult. It will remain open till Monday next, when the closing ceremony will be performed by the Chancellor of the Exchequer. The awards of the adjudicators will be published in a few days, and the prizes will be distributed by the Earl of Shaftesbury in January.

SOUTH LONDON WORKING CLASSES INDUSTRIAL EXHIBITION.—A public meeting, explanatory of the object, and in furtherance of the exhibition of works of skill and industry proposed to be held in South London, was held on Tuesday evening, the 1st of November, at the Rosemary Branch Assembly Rooms, Peckham, under the presidency of J. T. H. Cotsell, Esq., F.L.S., who was supported by Captain Dresser Rogers, G. M. Murphy, Esq., G. Livesey, Esq., W. H. Miller, Esq., S. S. Taylor, Esq., &c. Mr. G. M. Murphy explained that the success attendant upon the exhibition which was recently held in the Lambeth Baths had encouraged the promoters to make another effort in the same direction, and they had met to inaugurate an exhibition on a larger and more comprehensive scale, but nevertheless one which would be confined exclusively to the productions of the labouring classes. This Exhibition would differ materially from the last, and also from that now open in the north of London, inasmuch as it was intended to offer money prizes, varying in value from £1 to £10, as it was thought that many working men would be put to a great expense, and might incur an outlay which they could ill afford, in preparing articles for exhibition; and the prizes were intended to *recoup* them that outlay in some slight degree. However, if the exhibitor preferred it, he might have some other memento in lieu of money, as it was not intended to force money prizes upon those who would prefer something else. The guarantee fund was for the expenses incurred, and was totally distinct from the prizes. A resolution, "That this meeting, having heard the statement of the hon. secretary of the South London Working Classes Industrial Exhibition, hereby approve the project and accord it their most hearty support," was carried unanimously.

FLAX.—It is stated, on good authority, that the flax crop of Ulster, for 1863, was worth at least £20,000,000 to the country when manufactured.

DISCOVERY OF OLD COINS.—During excavations made at Saint Pons, in the department of the Hérault, in France, a mass of 300 to 400 coins was discovered; they are of silver, very thin, and but little oxidized. They are what are called Sols Melgoriens money, struck in the twelfth and thirteenth centuries, at Melgueil or Manguio, by the Bishops of Magnelone, and were current throughout Lower Languedoc. A piece of copper was found with the coins, and is conjectured to have formed a portion of the purse in which they were originally contained.

COTTON EXHIBITION AT NAPLES.—A curious announcement has appeared in the French journals which it will be best to give in the exact terms employed:—"M. Flourens announces that an exhibition is to be opened at Naples, concerning cotton. A scientific congress is to be held during the last fortnight, and the French savants are invited to attend."

GEOLOGICAL CONGRESS IN FRANCE.—The first meeting of this congress took place the other day at Marseilles, and has just commenced a series of visits to the various places of interest, in a geological point of view, in Province. More than forty members of the society were present, including several foreigners, but no English name appears in the list given. The first meeting was principally devoted to communications made by Messieurs Cogand and Matheron, who have given special attention to the geology of Province, and who were elected presidents. The congress will devote two days to a visit to Martignes and Berre.

Correspondence.

STUDY OF GEOMETRY.—SIR,—I take the liberty of saying a few words in your *Journal* as to the science of geometry. It is felt by many, and I think rightly so, that this is rendered unnecessarily abstruse. The range of education is now very great, embracing as it does nearly fifty different branches. It is true that but few, comparatively speaking, master the elements of all of them, but this is not material; even our Gamaliels admit that, as I believe, education must, ere long, be subject to a process of simplification. What is the difficulty in making geometry comprehensible to the million? It is not supposed by me that a general excellence will be attained in this, far from it. Some minds no doubt seem but little adapted to the understanding of the physical sciences. However this may be, it is really desirable to do something in this direction, even if it only be to lessen the wear and tear of our brains. An undue expenditure of this character weakens the mind, and unfits the student for the "struggles of life." This is, I think, as you will agree with me, worthy of consideration by the Council of your Society. Indeed, I might say that this question in

volves several results of serious importance. At present, however, I pass these by, though on another occasion I may advert to them. Why, sir, is Euclid still retained as the school book on this subject? In settling this question I wish to be understood as entertaining the most profound veneration for this philosopher. Beyond all question his theories and problems afford excellent practice, and are, as is generally felt, well calculated to discipline the mind for the consideration of abstract subjects. This is all very well for persons of maturity, but these are ill adapted to our youth, whatever our practice may be to the contrary. Why cannot the results be given simply as observations and rules? It seems to me that this would answer every ordinary purpose, and be a great relief to our collegians. My apology is due for venturing to make these suggestions, but I beg leave to say that I write under a sense of duty. Youths well instructed in the outlines of geometry would, I think, subsequently acquire with pleasure the deeper truths of this science. It has been remarked of Palissy, the French potter, that he maintained his health by the pleasure he took in his studies. We little conceive the labour we can undergo when we work with pleasure and delight. Perhaps you will favour me by the early insertion of this letter in your *Journal;* this will call the attention of your learned readers to this subject.—I am, &c., J. CULVERHOUSE.

MEETINGS FOR THE ENSUING WEEK.

MON. ...Royal Inst., 2. General Monthly Meeting.
Medical, 8. General Meeting. 1. Dr. Gibb, "On Throat Cough." 2. A. Balmanno Squire, M.B., "On Diseases of the Skin caused by the Acarus."
TUES. ...Syro-Egyptian, 7·30. Mr. Joseph Bonomi, M.R.S.L., "Notice of certain Fragments of Egyptian Sculpture under the Portico of the Museum of Bath."
WED. ...Geological Society, 8. 1. Mr. P. Martin Duncan, M.B., "On some Fossil Corals from Jamaica." 2. Mr. Ralph Tate, F.G.S., "On the Correlation of the Irish Cretaceous Beds." 3. His Excellency Sir C. Elliott, K.C.B., "On the Earthquake which occurred in St. Helena, on August 15th, 1864." Communicated by the Secretary of State for the Colonies, through Sir C. Lyell, Bart., F.R.S., F.G.S.

Patents.

From Commissioners of Patents Journal, October 28th.

GRANTS OF PROVISIONAL PROTECTION.

Bags, &c.—2507—G. Coles, J. A. Jaques, and J. A. Fanshawe.
Baking apparatus—2499—M. and T. Gillingham.
Bolts, nuts, and rivets, forging—2447—E. Davies.
Bookbinding—2491—E. L. Nicolas.
Button holes, machines for working—2557—C. T. Judkins and W. H. Gosling.
Chains (flat)—2492—J. Webster.
Chains (toothed) for working in chain wheels—2515—J. Slater.
Chimney cap—2453—T. Brown.
Chromium, salts of—2460—B. Margulies and J. K. Leather.
Chronometer watches—2575—W. E. Newton.
Coal, &c., obtaining fuel, &c., from—2487—J. Cassell.
Coffer dams—2593—J. Shaw.
Cornice poles—2517—J. V. Jones and G. J. Williams.
Crinolines—2377—C. J. W. Machon.
Deodorising substances—2559—A. Hill.
Distance indicator—2597—R. A. Brooman.
Dress fastenings—2514—J. G. Taylor.
Driving bands and chains—2474—E. Allen.
Electricity, transmitting currents of—2533—W. R. Sykes.
Envelope machines—2501—G. H. Reay.
Fermentation, apparatus used in—2535—J. Watts.
Fibrous substances, dressing and finishing—2483—R. M. Hands.
Fibrous substances, tube frames for spinning—2549—H. Mason.
Fire arms, breech-loading—2469—A. Muir.
Fire-arms—2482—G. N. Bolton.
Fires, composition for lighting—2503—J. W. Nottingham.
Gunpowder, barrels or casks for—2599—W. Hall.
Hair-brushing apparatus—2457—C. L. Oliver.
Heating and illuminating by hydro-carbon vapour—2510—F. Wilkins.
Hydraulic rudder break—2567—A. Paul and E. Paul.
Hydrocarbons, manufacture of—2525—J. Watson.
India-rubber threads—2516—R. Story.
Ink, manufacture of—2506—W. E. Newton.
Iron, bronze colouring—2504—H. Tucker.
Jewellery, setting stones in—2577—J. Ludwig.
Knife blades—2589—F. Walters.
Leather, hardening—2477—H and F. J. Kemp.
Ladies' waist buckles—2543—J. H. Brierley.
Lenses—2539—J. H. Dallmeyer.
Life-boats—2473—C. Chapman.
Locomotion, facilitating—2498—B. H. Jones.
Looms—2455—E. T. Hughes.
Lubricating apparatus—2541—W. Clark.
Metallic buttons—2467—J. P. Turner.
Motive power—2494—E. H. Huch and F. Winehausen.
Motive power—2555—F. A. Calvert.
Needles—2365—R. S. Bartleet.
Nut and lobster crackers—2521—A. S. Paterson.
Ordnance &c.—2476—R. S. Prowse, H. Duke, and T. Clayton.
Ores, purifying—2472—G. Haseltine.
Organ pipes—2493—H. T. Wedlake and F. J. Kitsell.
Photography on cloth, &c.—2465—P. A. le Comte de Fontainemoreau.
Projectiles—2480—W. E. Newton.
Propelling machinery—2464—P. A. le Comte de Fontainemoreau.
Prussiates of potash, manufacture of—2468—T. Parkins.
Railway carriages—2509—F. Watkins.
Railway signals—2461—W. Anderson.
Railway signals—2512—L. G. Loiseau.
Railway trains, communication between passengers and guards in—2518—M. J. Rice.
Railway wagons and carriages—2537—P. Meulemans.
Railway wheels—2601—J. Whitley.
Refrigerators—1501—J. Macarthy.
Sail cloths, &c., fabric suitable for—2561—J. Bruce.
Sewing machines—1634—W. Brookes.
Sewing machines—2547—J. Hayes.
Ships, constructing and arming—2478—A. Jackson.
Ships' sails, reefing, &c., —2490—J. Butchart and H. Stroud.
Ships' sails, reefing and furling—2489—T. Shorey and J. Bell.
Ships' sails, reefing and furling—2551—E. Baines.
Ships' sails, reefing and furling—2591—M. Gandy.
Signals—2456—F. Tolhausen.
Slide valves—2502—T. Adams and G. J. Parsons.
Spring mattress—2055—J. C. Desumeur.
Steam-cultivation—2481—H. S. Coleman and A. G. E. Morton.
Steam engines, slide valves for—2454—J. W. Gibson.
Stoppers for bottles, &c.—2573—N. Thompson.
Taps, cocks, or valves—2495—T. Lambert and H. C. Soper.
Telegraphic posts—2463—F. W. Shields.
Theodolites, &c.—2375—J. Lister.
Tobacco, &c., rolling and twisting—2479—R. E. Donovan and M. and F. O'Farrell.
Vegetable fibrous materials, preparing—2470—W. Clark.
Water, machinery for raising—2523—F. Noble.
Weaving, battens for—2529—J. T. Cook.
Wool, oiling—2471—G. Davies.
Yarns, preparing—2475—T. Kenyon, jun.

INVENTION WITH COMPLETE SPECIFICATIONS FILED.

Fire-arms, breech-loading—2590—W. Snell.

PATENTS SEALED.

1075. F. T. Aldridge and M. J. Jackson.
1076. R. H. Smithett and J. Davidson.
1078. R. H. Smithett.
1080. J. Little.
1082. J. McCall and B. G. Sloper.
1089. O. C. Burdict.
1090. J. K. Crawford.
1094. R. A. Brooman.
1095. R. A. Brooman.
1096. J. Mieussey.
1100. J. L. Norton, F. Gregory, and J. Salmon.
1103. W. I. Meacock.
1104. G. Gell and W. Cafferata.
1105. F. S. Barker.
1108. A. V. Newton.
1113. P. Ward.
1114. E. H. Newby.
1115. D. Nevin and W. Coppin.
1122. Y. Parfrey.
1124. J. Potter.
1126. W. T. Henley.
1131. C. J. Richardson.
1132. J. Gardner, R. Lee, and G. H. Wain.
1139. G. Haseltine.
1141. I., J., C., L., and M. Jefferson.
1146. G. Hodgson and A. H. Martin.
1154. F. Martin.
1162. J. R. Abbott.
1163. W. Powell.
1173. F. H. Wenham.
1220. C. Liddell.
1226. F. Blackwell.
1278. W. E. Newton.
1293. J. Adams.
1394. G. Coles, J. A. Jaques, and J. A. Fanshawe.
1584. D. Crowe.
1648. J. Ellis and J. Adams.
1656. S. Fox.
1680. F. J. Bugg.
1751. B. Smith.
1853. G. Lansdown.

From Commissioners of Patents Journal, November 1st.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2668. W. Wharton.
2671. E. Green and E. Green, jun.
2675. T. Moore.
2698. W. and T. Ryder.
2707. F. Bennett.
2766. J. Archer.
2751. J. H. Johnson.
2728. A., J., and J. Topham.
2753. A. F. Yarrow and J. B. Hilditch.
2863. G. T. Bousfield.
2720. E. Leigh.
2712. J. S. Jackson.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2721. J. Newall.
2777. G. H. and H. R. Cottam.
2782. M. F. Isoard.
2788. J. Mallisson, jun.
390. D., F., and G. Nurse.

THE

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110TH SESSION.] FRIDAY, NOVEMBER 11, 1864. [No. 625. VOL. XII.

TABLE OF CONTENTS.

Announcements by the Council.

Notice to Members.

The One Hundred and Eleventh Session of the Society will commence on Wednesday, the 16th instant, when the Opening Address will be delivered by Wm. Hawes, Esq., F.G.S., Chairman of the Council.

On Wednesday, the 23rd instant, a Paper by Wm. Fairbairn, Esq., LL.D., F.R.S., "On the Application of Iron to the Purposes of War and Naval Architecture," will be read.

The Chair is taken at Eight o'clock.

There will be three Courses of "Cantor" Lectures on the following subjects during the ensuing Session:—

"On the Relation of Science and Art to Manufactures." By B. Waterhouse Hawkins, Esq., F.G.S.

"On the Application of Geology to the Arts and Manufactures." By Professor D. T. Ansted, M.A., F.R.S.

"On the Application of Chemistry to the Arts." By Dr. F. Crace Calvert, F.R.S.

Mr. B. Waterhouse Hawkins will commence his course on Monday evening, the 12th of December.

These Lectures are open to Members free of charge, and a Member has the privilege of introducing ONE Friend to each Lecture. Particulars of the Courses will be duly announced in the *Journal*.

A List of Members of the Society is issued with this day's *Journal*, in a form suitable for binding with the volume.

ON THE PREPARATION OF FUEL FROM MEGASS.

By Henry Mitchell, Esq., M.D. (of Trinidad.)

It is almost unnecessary to inform those interested in colonial property that the stalks of the sugar-cane, or megass as they are usually termed, form the principal, and in many cases the sole material used as fuel for evaporating cane-juice in the manufacture of sugar. On their supply, therefore, in sufficient quantity, and of suitable quality, depends much of the planters' success in harvest; and dry megass thus becomes a very important element in preparing for market one of the necessaries of life.

But to obtain this indispensable article is a labour attended by many counterbalancing drawbacks, as may be seen by following the megass in its passage from the mill to the furnace. The canes, on leaving the former, have had their juice more or less fully expressed by the rollers, and the crushed stalks are either removed by hand or carried off on endless webs to large sheds, or *logies*, where they are packed for storage till such time as they appear dry enough to serve as fuel. As the solid refuse of the cane is bulky, the logies for its reception must be proportionately spacious, and accordingly on large estates they cost from £1,000 to £1,500. Under the actual system of manufacture they are indispensable, but their presence, stored with a highly combustible material, is a source of continued uneasiness to the proprietor. A spark from one of the chimnies, or from the pipe of a careless smoker, may set any of the logies in a blaze, and involve the whole sugar works in one destructive conflagration. Even when the fire is confined to the logie and the logie itself insured, the non-insured megass fuel is consumed, and the general result is that the manufacture of sugar is arrested or conducted under heavy disadvantages. The megass logies are exposed to other and more destructive influences, at the hands of incendiaries.

The expense which accompanies the present use of megass as a fuel does not end with its storing in the logie, as on an average only from 65 to 75 per cent. of juice is extracted from the cane by the mill, and as the ripe cane is known to consist of ten per cent. of woody fibre and ninety per cent. of juice, it follows that nearly thirty-five per cent. of weight remains in the megass; this, if immediately dried, would furnish as fuel not only its ten per cent. of woody fibre, but an additional five per cent.

of sugar, an exceedingly good, although somewhat expensive combustible. The available material for the furnaces would thus be increased fifty per cent., and be more than sufficient for all evaporating purposes required on a sugar estate. But this unfortunately is not the course pursued at present. The cane stalks, soaking in their residuary sweets, are consigned in a mass to the logie where, under the influence of heat and moisture, an active fermentation immediately commences, and their constituents are replaced by equivalents of acetic acid and water, which are not only incombustible themselves, but impede the combustion of the woody fibre till such time as they are dried out before or after being thrown into the hopper, entailing in the one case loss of labour, and in the other loss of heat already generated. There thus takes place in the logie a direct loss of thirty-three per cent. of the fuel consigned to it, while the remainder lies soddening in its own moisture, and solidifying by its own weight till dug out for transport to the furnace. Even here the expense and inconvenience attending the present mode of using megass as a fuel do not end; to insure its quality it should be spread out in thin layers to the sun and wind, after which it must be gathered up again and carried to the furnace hopper.

The expense involved in manual labour alone, connected with the present treatment of megass as a fuel, is enormous, and requires separate mention. On a well-conducted property (without mechanical assistance) five hands per day per hogshead of sugar made, were absorbed in the transfer and distribution of the crushed cane, and about as many more in spreading it out to sun and wind when damp, as it usually is in this climate. Leaving altogether out of consideration the last-mentioned class, and supposing the megass to be uniformly dry when taken from the logie to the furnace, it will not be difficult to estimate the saving in labour which would thus be effected, say in Trinidad. Take the crop at 40,000 hhds., which it has averaged for some years; this is usually made in 100 days, or at the rate of 400 hhds. per day; this at 5 hands per hhd. is equivalent to a demand for 2,000 hands during crop. To save these 2,000 hands in a country supplied with labour from India and China, at the rate of £21 per head, is equal to a money saving of £42,000, not once in a way but permanently, while sugar-making is continued. The saving of labour to Cuba or Demerara would of course be proportioned to their larger crops. This saving may be described in another form, viz., without any increase in the number of immigrants imported, 2,000 hands would be liberated from an employment no longer necessary, and made available for carting out manure, weeding young canes, and other agricultural operations of paramount importance, which are now from dearth of labour almost or entirely neglected, to the great injury of the ensuing crop.

The evils arising from the use of damp fuel are not limited to points of plantation economy; they extend much further and involve the social well-being of the colonies more than is usually supposed. Damp fuel protracts the hours of labour at the sugar-works from 15 to 18 or 20 hours, sometimes even longer, and the estate labourers, though fond of the crop season and its indulgencies, though willing and enduring to a degree unsurpassed elsewhere, become fagged and disgusted. The appetite for ardent spirits, rarely dormant, is whetted and too freely indulged, while the promiscuous employment of the sexes in protracted night work leads to an amount of social demoralisation which no preventive or remedial steps can reach, and which must tell sadly against the industrial and moral future of both the peasantry and their employers. Night work was the distinctive and most abhorrent feature of slavery, and its abuses, patent to every disinterested eye, led more directly to emancipation than the unseen horrors of the middle passage.

Having thus, as shortly as was compatible with the importance of the matter, pointed out the cumbrous insecurity of the megass logie system, the absolute waste of nearly 33 per cent. of the fuel consigned to the logie, the expenses, not merely of construction, but of hand labour entailed by its maintenance, and, though last not least, the social degradation with which it has hitherto leavened and contaminated those exposed to its influence, it is time to say a few words on an arrangement which, in all probability, must soon displace it. An apparatus has been invented by Mr. H. Warner, called a "megassiccator," which is a machine for rapidly drying the crushed cane stalks; it is simply a chamber of iron or other convenient material, traversed by a series of endless metallic webs, on which the megass travels for a longer or shorter period exposed to a current of heated air till it falls out at the lower end as dry as tinder. The chamber is of size proportioned to the power of the mill to which it is adapted, and is so placed as to receive the crushed canes directly from the mill roller on one extremity of the first or highest of the endless metallic webs. The webs are in three or four tiers superposed horizontally one over the other. The megass travels along the first tier of metallic webbing till it falls on the second one, moving in a contrary direction, and placed about three feet lower, along which it returns to drop on the third, and so on till it finally reaches the furnace hopper. As this arrangement is automatic, none of the hands employed in the old system are required.

The megass as it travels along the chamber on the metallic web encounters a current of heated air, driven in an ascending or descending direction as the case may be. This heated air is taken by a fanner from the products of combustion as they pass along from the sugar boilers to the chimney. Its amount is regulated according to the size and speed of the fanner, which last, in common with the metallic webbing, is driven by a small engine quite unconnected with the cane mill, experience having shown this to be requisite. The heated draught may be cooled down by an admixture of cold air to any degree as it leaves the fanner, and this obviates the least chance of the megass being inflamed in the apparatus. Of this, however, there is no real danger at any time, because when the waste heat is received from a multitubular boiler it has been already pretty well exhausted, say to 400° Farenheit, and becomes still further lowered before reaching the fanner. In the experimental trials of the megassiccator, which were conducted on a working scale, the fanner, which was six feet in diameter, with eight curved blades, never attained a speed over 250 revolutions. The webs were 6 feet wide, the two upper tiers 19 feet, and the third 23 feet long, in all about 60 feet, and as they travelled at the rate of from 5 to 7 inches per minute the megass consequently took from $1\frac{3}{4}$ to $2\frac{1}{4}$ hours to dry; the trials, which were repeated at intervals during the season, while satisfactory as to the principles involved, afforded ample opportunity for noting such modifications as might be useful in practice.

The heated air from ordinary sugar pans, where a multitubular boiler is not used, ascends the chimney at a temperature of about 700°. If then it should be considered desirable to employ it without much dilution, the fanner must be so arranged as to drive the heated draught downwards through the chamber, and thus bring the heated air first in contact with the megass wet as it leaves the mill, in which state it is so uninflammable that it will immediately deaden and ultimately extinguish the fire, if introduced into the most energetically-acting furnace: excess of moisture will thus be opposed to excess of heat, and all danger of fire avoided; as a further precaution a jet of steam may be made to enter the chamber either continuously with the heated draught, or when thought necessary by the attendant. To prevent the injurious action of extreme heat on the vanes of the fanner, such as occasionally occurs to dampers, it is necessary in hanging the former to make provision for admitting sufficient air from without, or the fanner may be so placed as to draw the products of combustion through the chamber

instead of forcing them through. These details, however, are unnecessary in the present general description.

The donkey-engine used in the trial workings was a 3-horse power, and inadequate to drive the fanner, and at the same time enable the web to carry away all the crushed canes from a mill which was grinding nearly 4 hhds. per day; the web received, however, two thirds of the megass, which was thoroughly dried with the fanner speed already mentioned, and at a temperature in the chamber which never exceeded that of the surrounding atmosphere by 100°. This low temperature requires a word of explanation; although the draught left the multitubular at a temperature varying from 400° to 450°, it was cooled down to 180° F. as it passed the fanner, by the action of a damper so hung as to abstract more or less the heated air while it admitted the cold. This precaution, which was adopted to avoid all danger from fire, was carried unnecessarily far, but established unequivocally that a very moderate temperature could, with an increased speed of fanner and an accelerated movement of the webs, dry the whole megass. This last observation is important, as it proves that in practice the megassiccator may be successfully worked even when much of the heat otherwise lost has been already utilised by the employment of multitubular boilers, while by its adoption the disadvantages of the common boiler system will be compensated by a supply of good fuel more than adequate for all requirements.

It is noteworthy that the effect of flame from megass, which has been dried without losing its residuary sweets, is not limited to the apparent theoretical results of the combustion of the 10 lbs. of woody fibre + 5 lbs. of sugar it contains. Coal as a fuel is twice as powerful, weight for weight, as woody fibre and sugar, but in daily practice it is found that for an equal area of grating bar surface good megass far surpasses coal in speediness of action and intensity of result, whether for evaporation from the range of sugar pans, or raising steam in boilers. With good dry megass a square foot of grating bar will often evaporate 200 lbs. of water per hour. This subject has never been practically examined, although as far back as 1782 Casaux remarked, that "as applied to sugar pans the long lambent flame from dry megass was decidedly superior to that from any other fuel." The intensity of the volume of flame produced by good dry megass is probably due to the fact that the loosely aggregated tissue of this fuel when used alone completely fills up the furnace chamber, so that it burns without the flame being diluted by much more air than is required for combustion, and this is shown by Rankine (see his work on "The Steam engine and other prime movers," p. 284) to make a difference in some cases of 2,000° F. in the temperature of the flame.

The intensity of the heat thus furnished by the increased quantity and superior quality of the fuel dried by the megassiccator is accompanied by great primary economy in the original erection of the sugar works, which, although it comes late into the field, will be duly appreciated by those who raise chimnies in these regions of earthquakes and hurricanes. A set of works calculated to boil off 600 hhds of sugar requires a stalk over 100 feet high, which, with its appliances, will cost at least £1,000, its draught will be at the outside 1 lb. to the square foot, while a megassiccator for an estate of the same scale, of the best material and workmanship will cost less, and not only furnish a draught equal to a chimney *one thousand* feet high, but dispense altogether with the use of such a stalk and the expense of its erection. The results obtained from the fanner in the working trials were quite in accordance with the views of Prideaux, as laid down in his valuable treatise on fuel. While the fanner revolved at the moderate speed already mentioned, and diverted the heated draught from the chimney, the contents of the sugar pans boiled fiercely, but when the fanner ceased playing and the draught returned to the chimney, the syrup subsided to a sluggish simmer. The chimney showed a direct disadvantage compared to the mechanical draught. Should any doubt remain on this point it will be dissipated by reference to an experiment by the Nestor of flues (see Williams on "The combustion of coal and prevention of smoke," Weale's edition, page 179), who states that he obtained not only 240° more heat, but saved 28° per cent. fuel by substituting fanner action for the ordinary chimney draught.

To resume briefly the advantages of the megassiccator, as contrasted with the ordinary mode: it presents simplicity of construction, facility of erection, durability of material, united in a mechanism independent of the general motor power, automatic, self-contained, scarcely admitting of derangement, requiring but the space of an ordinary boiler, and entirely excluding the risks arising from accidental or wilful firing of megass logies. Under its influence the question of fuel on sugar estates assumes a novel aspect. No longer scant and of bad or unequal value, the megass increases 50 per cent. by the operation of drying, or rather 50 per cent. is saved which would be otherwise lost by fermentation. This abundant supply of fuel used in the manner indicated, under circumstances the most favourable for combustion, is of necessity accompanied by speedier evaporation, and this, in its turn, by earlier closing hours; the work of the boiling house following fast on that of the mill, the daily labours of a sugar estate may close with sun-down; and though last, not least in point of economy, as the quantity of fuel prepared is in excess of all requirements, there will be no occasion, with the mere view of economising fuel, to substitute multitubular boilers where they do not already exist for those of ordinary construction.

The megassiccator is certainly a great improvement on the present faulty system. The time will, however, assuredly come when the principles of a juster economy, correctly reduced to practice, will enable the planter to extract all the sugar from the cane, and to return the residue to the soil as manure, or convert it into paper, for which it is well adapted, not only by texture but by quantity, the weight of the cane-stalks annually consumed as fuel in the West Indies alone being somewhat over a million tons, for the ten per cent. of woody fibre in the cane is considerably heavier than the sugar it yields. The cane-stalk also possesses this marked advantage over the bamboo, and most other textile plants extensively used in paper-making, viz., that when divested of its external covering, and thoroughly washed, the fibrous pulp remains of dazzling whiteness.

THE NORTH LONDON WORKING CLASSES' INDUSTRIAL EXHIBITION.

The exhibition which has been held at the Agricultural Hall during the last three weeks, was formally closed, with some ceremony, by the Right Hon. W. E. Gladstone, Chancellor of the Exchequer, on Monday evening, the 7th of November.

The ceremony was similar in character to that observed at the opening, when Earl Russell presided. Shortly after seven o'clock in the evening the Right Hon. W. E. Gladstone, accompanied by Mr. Arthur Kinnaird, M.P., and Mr. Samuel Morley, was escorted to the chair on the platform by the members of the committee. The choir, numbering several hundred voices, then sang the Hundredth Psalm.

Mr. W. J. Watts, the secretary, then read the report, which, after acknowledging thankfully the guidance of the efforts of the committee by the Giver of All Good, stated it was originally intended to close the exhibition on the 21st October, but representations were made which induced the committee to extend the time by one week, and they were the more easily enabled to do this through the liberal manner in which the directors of the hall had met them. Although there had been a very general request that the prices of admission should be increased, the committee felt bound not to change them during the time for which it had been originally announced they

would be charged; but when it was determined to keep the Exhibition open for an additional week the committee fixed the charge for admission at 6d. The number of persons who had visited the Exhibition was as follows:—On the 17th October, 4,860; the 18th, 10,233; the 19th, 16,350; the 20th, 10,820; the 21st, 8,300; the 22nd, 11,849; the 24th, 17,635; the 25th, 17,000; the 26th, 16,000; the 27th, 22,000; the 28th, 12,242; the 29th, 14,932; the 31st, 7,600; the 2nd November, 7,000; the 3rd, 5,000; the 4th, 4,413; the 5th, 4,090; making a total of 196,926 persons. Notwithstanding the largeness of the attendance only six policemen had been engaged in the building, and there had not been a single case of wilful damage or loss, but a few glasses had been accidentally broken. The prizes awarded by the adjudicators numbered 336—first class, 81, and the second class, 76; honourable mention, 179; in addition to which 10 special prizes were awarded. The prizes would consist of a certificate, which in itself would be a work of art of considerable merit, in the Italian style. In the centre there would be a photographic view of the exhibition, supported by figures of Strength and Beauty and Labour and Taste; Fame and Fortune would be at the base, and between them a medal representing the Genius of the Exhibition. On shields would be a record of the opening of the Exhibition by Earl Russell, the closing by the Right Hon. W. E. Gladstone, and the presentation of the prizes by the Earl of Shaftesbury, which would take place in January at Exeter Hall. As a memorial of the exhibition, the report also stated that an illustrated catalogue would be published.

Dr. Wesley's Ode, composed for the opening of the exhibition, the words by W. H. Bellamy, Esq., was sung by Madame Louisa Vinning, Miss Susan Pyne, Miss Leffler, and Mr. Lewis Thomas.

The right hon. chairman was then conducted round the exhibition, Dr. S. S. Wesley performing on the organ in the meantime.

On the chairman's return to the platform the Rev. T. W. Fowle, M.A., of Holy Trinity, Hoxton, offered a prayer.

The choir having sung the "Hallelujah Chorus,"

Mr. Gladstone addressed the meeting at considerable length, and declared the exhibition closed, and the proceedings terminated with a vote of thanks to the chairman, proposed by Mr. Samuel Morley and the Hon. A. Kinnaird, M.P., followed by "God save the Queen."

Proceedings of Institutions.

Glasgow Athenæum.—The certificates awarded by the Society of Arts to the students of the Athenæum, and the prizes offered by the late Hugh Tennent, Esq., to the most successful students, were distributed on Tuesday week, at a public meeting held in the Lower Hall of the Institution. The Hon. the Lord Provost presided, and around him were W. West Watson, Esq., City Chamberlain; Councillor Neilson; M. Provan, Esq.; Dr. Pritchard; J. G. M'Gill, Esq., Chairman of the Board of Directors; Robert Allan, Esq.; A. H. M'Lean, Esq., and other members of the Local Board of Examiners. Proceedings were opened by the chairman calling on Mr. Provan to read the report of the Local Board of Examiners, which stated that the number of students examined by the Local Board this year at the sifting examination was 52, being an increase of five above last year, of whom 50 passed and two were rejected. Of these 42 presented themselves at the Annual Examination, and 38 obtained certificates, four being unsuccessful. Fifty papers were worked and 45 certificates granted, viz., 19 first class, 17 second class, and nine third class. There were in all seven prizes awarded, of which four were second prizes, two first prizes, and the prize given by the late Prince Consort, being 25 guineas, and the highest certificate in the gift of the Society, which was publicly presented to Mr. John Allan, the successful competitor, by the Prince of Wales. The students, four in number, who gained the prizes, viz., Messrs. Alexander Johnston, James Wade, James Dougall Borthwick, and John Allan, were each entitled to £5, given by the late Hugh Tennent, Esq., whose loss was deeply felt by the Institution, he having, by stimulating the efforts of the Athenæum students, aided largely in enabling them to attain the distinguished place which they held in these Examinations. The Lord Provost then distributed the certificates, and gave away the money prizes left by Mr. Tennent. In addressing the meeting, the Lord Provost said that he had very much pleasure in being present, and having the honour of presenting these certificates. It was a very happy idea of the Society of Arts—the institution of these prizes and certificates for competitive Examinations. That Society was in a position to stimulate the attention of young men attending the various classes of this and similar Institutes in a way that could not well, perhaps, otherwise have been done. Although one of these certificates might not have very much value in the eyes of some, yet they were of much value to the young men themselves, in having stimulated them to take the position in these classes they had taken, and would prove of peculiar value in their future life, as they would show that, at an early stage of their career, they took a high possition in the various subjects of their study. Of those who were not successful in getting these certificates, but who might very nearly have acquired one of them, it could be said that they had not been altogether unrewarded, for undoubtedly they had given closer attention to the various departments of study to which they had addressed themselves than they would otherwise have done. He had to-night given away sums of money which had been left by one of their townsmen, who took a very great interest in most things connected with the good of the city, and especially with the education of the young. Mr. Tennent had for a long time given special attention to the classes connected with the Athenæum, and for many years he had taken an interest in students progressing through the University, chiefly with a view of following out studies in divinity. He maintained for these young men teachers in elocution, and teachers in some other of the subordinate departments, stimulating their attention by prizes. Several of these he had made permanent by bequest or gift, made some years before his death. He had made provision for a portion of these in the case of other Institutions, but his being cut off so suddenly had, perhaps, prevented that provision for this Institution which there is little doubt he contemplated. The city of Glasgow had lost in him an estimable citizen, and many Institutions, to which he had contributed, a valuable friend. He rejoiced, in looking over the report of the Society of Arts of last year, to observe the position that this Institution had taken. Looking at the number of students who went forward from the Athenæum, this Institution had attained a larger proportionate number of prizes and first-class certificates than any other Institution in Great Britain. Mr. John Allan (Prince Consort's prizeman) moved a vote of thanks to be given to the members of the Local Board of Examiners. In briefly moving this vote, he made a special reference to the labours of the secretary, Mr. Provan. The meeting warmly supported the motion, to which Mr. Pritchard replied. Mr. M'Gill having moved a vote of thanks to the Lord Provost for presiding on the occasion, the proceedings terminated.

Manufactures.

Minium of Iron.—The society called the *Académie Nationale*, of Paris, has awarded a medal to M. de Cartier

for his preparation of *Minium de fer d'Anderghem*—the name of the place of manufacture in Belgium. The *Société d'Encouragement* and the *Société Centrale des Architectes*, also of Paris, have likewise reported favourably on the product. The minium of iron is said to answer all the purposes of white lead, and other preparations of the like kind for painting, and to possess more solidity, to be cheaper, to last longer, and to have an especial value in preserving iron from oxidation, and rendering the surface of wood hard. Remarkable freedom from acid or adulteration is claimed for M. de Cartier's product, which is also said to lie on iron surfaces evenly and smooth like a varnish, effectually excluding air. It is in use on the Belgian railways and steam boats, and also in the army and the prisons; and it is recommended for dressing canvass for awnings, tarpaulings, and other protecting sheets. It works with linseed boiled oil, like any other pigment, or with cold oil with a little dryer such as litharge, but not turpentine; but for painting iron, to be exposed to sea water, litharge must not be used. It must be mentioned, however, that it is of a dark brown colour, but its tone may be changed by the addition of black, yellow, or green. Its durability is said to be two or three times greater than that of white lead. It will bear a great amount of heat, and, mixed with tar, forms an excellent pigment for boats, hardening the wood in a remarkable manner. When mixed with oil it does not separate again like whitelead, or become clotted. The following are the proportions given for its use: a kilogramme of minium, with $1\frac{1}{4}$ kil. of oil, and $\frac{1}{20}$ kil. of drier.

Colonies.

LABOUR MARKET, MELBOURNE.—The cold inclement weather (August, 1864) has prevented farming operations and caused an almost cessation of demand for that description of labour. Married couples unencumbered with young children are in moderately fair demand at steady rates of wages. Thoroughly competent servants, enabled to give good references, are in steady request, but young women unused to household work, or suited only for farm work, are numerously unemployed, and find difficulty in procuring situations. Male domestics of all kinds are comparatively in little or no request. Rates of wages are, however:—Married couples, £50 to £70; female cooks, £40 to £52; housemaids and laundresses, from £25 to £30; nurserymaids, from £16 to £18 per annum; men cooks for hotels, £55 to £60; ploughmen, £40; grooms and coachmen, from £40 to £60 per annum; gardeners, 25s. per week.

Notes.

PROPOSED INDUSTRIAL EXHIBITION IN MARYLEBONE.—The All Souls (St. Marylebone) Club stands forth as one of the greatest successes yet achieved in this movement, and as pointing out how, in connection with it, the co-operative principle may be introduced with advantage. It started at the commencement of the year on a basis of non-sectarianism and perfect equality, twopence per week and no entrance fee conferring the use of two bagatelle rooms with three boards, a suite of rooms for reading, chess, draughts, &c., over a pipe, and a suite ditto for the non-smokers, a large room at back where elocution, singing, and other classes are held and concerts given. A co-operative store has been started, and the report of the committtee shows a profit of 19 per cent. on the first month's working. The members can also obtain good and cheap coals by co-operation, a coal club being in action on the premises. The committee now invite the working men of Marylebone to join in holding a working-classes industrial exhibition at Christmas time in the school-room of Great Portland-street, where a public meeting will shortly be held on the subject, with Mr. Peter Graham as chairman.

EXHIBITION AT COPENHAGEN.—There has for some time been a strong desire that there should be a general exhibition of the manufactures and works of art of all the Scandinavian States, and that it should be held in Copenhagen, in the same way that exhibitions of the same kind, which were first held in London, have since taken place in Paris and elsewhere. A committee for carrying the wishes that had been expressed on this subject was therefore some time ago appointed, of which his Royal Highness Prince Oscar was selected to be the president, and the report has just been published, in which it proposed "That an exhibition of the products of the three Scandinavian States—Sweden, Norway, and Denmark—should take place in the summer of 1866, and that for that purpose a crystal palace should be constructed at the expense of the state and of the capital."

CRYSTAL PALACE IN HOLLAND.—A Crystal Palace has been opened at Amsterdam with great solemnity, and in the presence of inhabitants from all parts of Holland. The model of Sir Joseph Paxton's structure of 1851 has been adopted with much success, and the structure offers a remarkable contrast to most of the public and private buildings in the capital. The project was started as long ago as 1853, but in consequence of all kinds of hindrances being offered, the building was not commenced till 1858, and since then many circumstances have combined to prevent its completion; but the projector, Dr. Sarpathi, has at last experienced the satisfaction of seeing the building finished and opened with an exhibition of art and industry. The patron of the undertaking, Prince Frederick, uncle of the King, presided at the ceremony, and replied in a most gratifying manner to an address from Dr. Sarpathi, whom the Prince decorated with the Order of the Lion of the Netherlands.

THE RAILWAY TUNNEL UNDER THE APPENINES.—The tunnel under the Appenines, on the Bologna and Florence line, has just been opened to the public. Travellers may now proceed from Turin and Milan to Rome and Naples without any other interruption on the railway than the few miles which separate Civita Vecchia from Orbitello, on the Tuscan coast.

Correspondence.

DWELLINGS OF THE LABOURING CLASSES.—SIR,—The continued ventilation of that important question—the house accommodation of the labouring class (and more particularly of that portion of the body employed in agriculture)—cannot but prove of great benefit, for it is one of those circumstances which, sanctioned by long usage, has become strengthened by time, till the mind has become so accustomed to it as to turn with repugnance from any alteration. I do not mean to say that there is at the present time any aversion to considering the subject, for it is manifestly admitted on all hands, and on every possible occasion, to be one of the crying subjects of the day. But I do submit that the question is not generally viewed in that light which common sense would direct us to look at it. That it is impossible to carry out the improvement of the dwellings of the labouring class, as a mere act of charity, is plain without further proof. That by such means the benevolent views of individuals may be carried out is admitted, and much and sincere praise is due for such attempts—but through the length and breadth of the land this would be futile and inefficient. So, likewise, to open the door for greater publicity for speculative builders in this matter, would only aggravate the mischief, by rendering that more easy which has already produced misery and degradation enough, in unfit and imperfect dwellings. But common sense will teach us that, in order to make such a movement as we desire lasting and universal, the

sympathies and desires of the class must be excited to further it. That to have men and families appreciate the blessings of decent Christian homes, they must learn to practise those qualities which give warmth and cheerfulness to the domestic hearth—the qualities of temperance, free-thought, and self respect. Without these it may be asserted that the poor man, were he placed in a palace, would find no home. It is with the view, therefore, of thus bringing the action of the labouring class into this question that I argue in favour of the adoption of any system which would give stimulus to the production of such qualities as I have enumerated before, and which will fit the poor man for a home where they might be called into exercise; and this system, I humbly think, may be found in co-operative action, of which we have lately heard so much; and I sincerely believe that by giving every encouragement in our power, as individuals, to a plan which has in many instances worked so much substantial good among the poor, that we shall generate mong them feelings which will make them appreciate more decent dwellings, and those which more befit a Christian country, than the loathsome dens in which they are now often found. Thus will their sympathies be enlisted in favour of the movement, and the end of it, viz., the improvement of the classes, be effected by the very means intended—their having, or trying to have, better dwellings.—I am, &c., J. BANKS ROBINSON.

Melford, Sudbury, October 29, 1864.

MEETINGS FOR THE ENSUING WEEK.

MON. ...R. Geographical, 8½. 1. President's Address. 2. Captain R. F. Burton, "On the Present State of our Knowledge with regard to the Source of the Nile. 3. The late Richard Thornton, "Journey to the Snowy Peaks of Kilimandjaro. 4. Letters from M. du Chaillu and Baron von der Decken.

TUES. ...Civil Engineers, 8. Mr. G. O. Mann, "On the Decay o Materials in Tropical Climates, and the methods for arresting and preventing it."

Statistical, 8. Mr. E. T. Blakeley, "On the Commercial Progress of the Colonies, 1858 to 1863."

Anthropological, 8.

WED. ...Society of Arts, 8. Opening Address by Wm. Hawes, F.G.S., Chairman of the Council.

THURS...Linnæan, 8. 1. Mr. Blackwall, "On the Movements of Insects over Polished Surfaces." 2. Dr. Shortt, "On a huge Banyan Tree in the Chingleput district."

Chemical, 8. Dr. Marcet, "On the Brine of Salt Meat." Professor Wanklyn, "On the Nature of the Compound Ethers."

Patents.

From Commissioners of Patents Journal, November 4th.

GRANTS OF PROVISIONAL PROTECTION.

Blasting, safety fuses for—2566—W. E. Newton.
Boots, &c., cutting out and pricking the soles and heels of—2637—H. E. Craven and T. Carrack.
Bricks, tiles, &c., manufacture of—2627—S. S. Anderson.
Carriages—2572—J. Macdonald.
Cartridges—2623—W. Richards.
Cases and frames, printers' composing—2619—W. O. Walbrook.
Casks, &c., emptying the contents of—2641—E. H. Taylor.
Centrifugal machinery, applicable to pumps, &c.—2603—J. E. A. Gwynne.
Coals, &c., machinery employed in getting—2613—J. G. Jones.
Compasses—2459—E. V. F. Huntzinger, jun.
Corns, bunions, &c., eradication of—2553—T. Randle.
Cotton-pressing machinery—2462—H. Nelson.
Fabrics, composition for finishing or renovating—2576—J. Johnson.
Fibrous substances, preparing—2649—J. Hall, W. Dunkerley, and S. Schofield.
Fire-arms, breech-loading—2609—S. Westwood and H. Broadhurst.
Fire-arms, caps for—2324—F. L. M. Dorvault.
Fire-arms, conversion of muzzle-loading into breech-loaders—2458—T. Turner, jun.
Fire-places—2643—E. B. Wilson.
Fringes, manufacture of—2657—J. Walmsley and N. G. Pitman.
Furnaces and crucibles—2318—T. A. Rochussen.
Garments, means of attaching buttons to—2631—J. W. Scott.
Guns, breech-loading—2585—T. Turner, jun.
Ink bottles, fasteners for pocket—2531—J. Cooke.
Jute, &c., preparation of—2505—H. L. Kolzewsky and A. Wilson.
Knives, hafts or handles for spring—2580—W. and F. W. Gilbert.
Magneto-electric machines—2486—C. H. Collette.
Metal cornice, &c., manufacture of—2611—T. Allcock.
Metal sheets, corrugating, fluting, or fashioning—2574—C. Pettit.
Mirrors, ovens employed in the manufacture of—2448—J. H. Johnson.
Motive power—2451—B. J'A. Bromwich.
Oils, apparatus for distilling—2653—J. Nimmo.
Oils, extracting from bituminous substances—2105—C. G. Lundborg
Projectiles—2587—J. P. Harriss.
Pumps, construction of—2633—H. Bateman and E. G. Garrard.
Purses, cigar-cases, &c.—2651—F. Jenner.
Railway trains, signalling on—2280—J. Adams.
Reaping and mowing machines—2615—R. Hornsby.
Rotary engine—2629—G. Schorb.
Sail-cloth, threads and yarns employed in the manufacture of—2402—G. H. Harrington, and H. and F. Y. Hewetson.
Sails, reefing and furling—2568—S. Howard and W. Wood.
Sheep's wool, preparation of, for medical purposes—2583—W. Buxton.
Ships' bottoms, preventing the fouling of—2645—J. Dannatt.
Ships, propellers for—2488—S. Vaile.
Silk, twisted—2424—W. Clark.
Steam-cultivation—2466—W. Steevens.
Stays and bodices, covering busks for—2584—G. Hartley.
Theatres, producing optical illusions in—2564—J. Maurice.
Tubular boilers, preventing leakage in—2444—C. H. Reid.
Yarns, washing—2251—A. Wever.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Fish hooks, manufacture of—2688—C. O. Crosby.

PATENTS SEALED.

945. A. Normandy.
1120. J. McDowell.
1135. H. H. Henson.
1140. W. Simpson.
1142. J. J. Miller, jun.
1147. J. Turnbull.
1148. W. Hirst.
1149. A. Rieder.
1150. C. P. Stewart and J. Gresham.
1152. A. Swonnell.
1155. J. H. Johnson.
1156. J. H. Johnson.
1158. J. Wavish.
1159. J. Cameron.
1165. E. Heywood.
1166. H. Woodward.
1167. E. Tombs.
1176. G. Pulsford & G. Walkland.
1180. T. W. and R. Condron, and G. R. Hartshorne.
1181. J. A. Wanklyn.
1193. W. Weild.
1196. T. M. Gisborne.
1198. R. Wilson.
1210. R. F. Fairlie.
1224. B. Gyte and M. Walsh.
1257. A. B. Childs.
1261. G. Homfray.
1300. G. Shaw.
1384. W. E. Newton.
1474. W. E. Newton.
1480. F. A. E. G. de Massas.
1752. C. Claxton.
1860. J. P. Ravard.
1913. H. Carter.
2088. A. A. L. P. Cochrane.

From Commissioners of Patents Journal, November 8th.

PATENTS SEALED.

1170. J. Chambers.
1182. S. Dreyfous.
1184. J. Rowland.
1185. M. Morgans.
1192. J. Brown and A. P. Price.
1194. J., J. and J. Booth.
1203. W. Horne.
1204. J. L. Norton.
1205. T. N. Kirkham and V. F. Ensom.
1208. R. D. Dwyer.
1209. J. Dodgeon, J. Gaukroger and W. Shackleton.
1211. E. Myers & T. G. Progers.
1216. G. Haseltine.
1218. D. Bateman.
1222. R. Griffiths.
1225. P. Craven.
1230. R. Jones.
1270. J., E. G. and C. H. Freeman.
1271. H. Defries.
1277. W. Tasker, jun.
1323. J. B. Fuller.
1342. W. E. Newton.
1614. C. J. Tinker.
1912. H. Attwood.
2059. B. Burton.
2149. H. Bennison.
2213. D. Brodie.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2745. M. and M. Myers, and W. Hill.
2777. R. Fethney.
2810. A. B. Berard.
2772. R. Wilson.
2798. H. G. Gibson.
2799. J. Hancock.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2802. C. E. Amos.
2803. C. Clay.
2814. H. R. Palmer.
2824. J. Adams.

LIST OF PRESENTS.

The following Presents have been made to the Society during the past year. The thanks of the Society have been forwarded to the donors:—

Presents.	Donors.
Specifications of Patents up to the present time, and Indexes	Commissioners of Patents.
Abridgments of ditto	,,
Commissioners of Patents' Journal.	,,
Journal of the Society for the Encouragement of Manufactures at Munich, 1851–62	Society.
Official Austrian Report on the International Exhibition of 1862	Austrian Ministry of Commerce.
Hand-book of Average, by Manley Hopkins	Author.
Twenty-seventh Annual Report of the Art Union of London	Art-Union.
Journal of the West of England Society of Agriculture for 1863 ...	Society.
Memoirs of the Royal Astronomical Society, Vol. xxxi., 1861–62	,,
Antiquities found on the sea coast of Cheshire. Rev. A. Hume, LL.D., D.C.L.	Author.
Report on the International Exhibition of 1862, by J. W. Del Campo	,,
Spargo's Statistics and Observations on the Mines of Cornwall and Devon, 1864.	,,
The Science of Vision, by Arthur Parsey	Samuel Parsey.
Illustrated Catalogue of the Brett Collection	Jacob Brett.
The Exhibited Machinery of 1862, by D. K. Clark, C.E.	Author.
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ERRATA.

Page 114, col. 2, line 5 from bottom, for "flax" read "wool."
,, 318, col. 1, line 6, of Dr. Marcet's speech, for "less carbonic acid" read "more carbonic acid."
,, 569, col. 1, line 9, for "of its professors" read "to its professors;" and line 25, for "but the artists having" read "the artists not having."
Page 620, paragraph 6, for "31st February" read "28th February."
,, 687, col. 2, line 10 from bottom, before "essayist" omit "young."
,, 688, col. 2, line 37, for "Parois" read "Pavis."

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F.

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